

Machine and Tool BLUE BOOK

A Hitchcock Publication

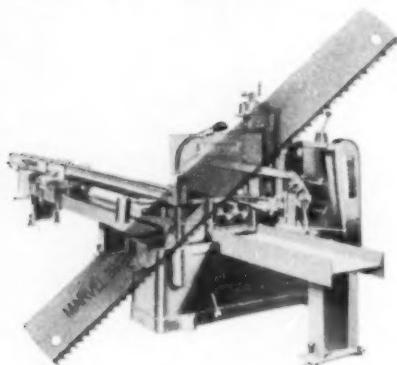


NOW - "FASTER
FLOOR-TO-FLOOR
TIME," SAYS
ALAN MATTISON,
president,
NATIONAL MACHINE TOOL
BUILDERS ASSOCIATION
—See page 123

JUNE · 1960

a message to owners of MARVEL HACK SAW MACHINES

If you are the owner of a MARVEL Hack Saw Machine, check the name on the blades being used in it. If they are not MARVEL Blades, the chances are very good that you are not getting all the cutting-off speed, accuracy, and economy you paid for when you bought a MARVEL Saw.  Consider this fact. The hack saw *blade* is the cutting tool that actually does the cutting job. If the machine is expected to deliver its full efficiency, the blade must possess a ruggedness comparable to that of the machine.  Isn't it logical, then, that the blades you use be as carefully selected as the machine itself? Here is another fact: The MARVEL High-Speed-Edge Hack Saw Blade was designed specifically to withstand the heavy feed pressures and high cutting speeds your MARVEL Hack Saw can deliver.  Only MARVEL UNBREAKABLE Hack Saw Blades can be safely tensioned taut enough to provide the maximum rigidity of the cutting tool necessary for accurate cutting-off; and at

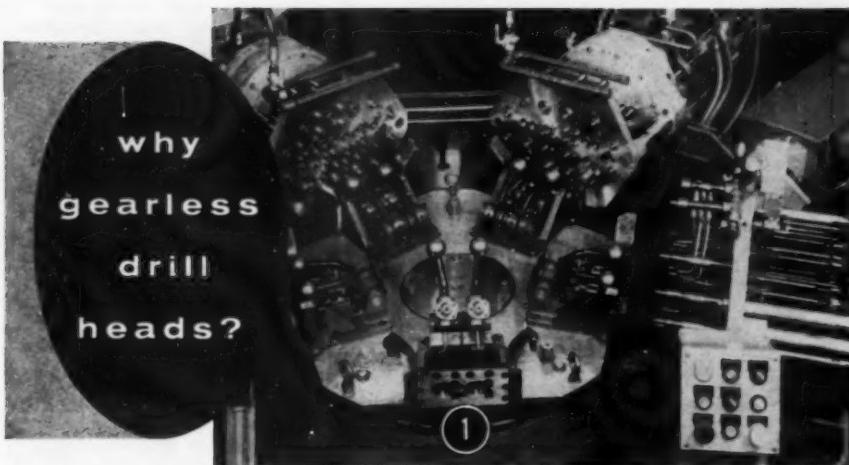


the same time, protect both the operator from injury and the machine from damage that so frequently occurs with "breakable" blades.

Why not be certain your MARVEL saw is delivering the high performance you had originally purchased, by using the only blade capable of utilizing the power and accuracy built into the machine? MARVEL Hack Saw Machines and MARVEL High-Speed-Edge Blades are an unbeatable combination. MARVEL High-Speed-Edge Hack Saw Blades are stocked and sold by leading Industrial Distributors everywhere.

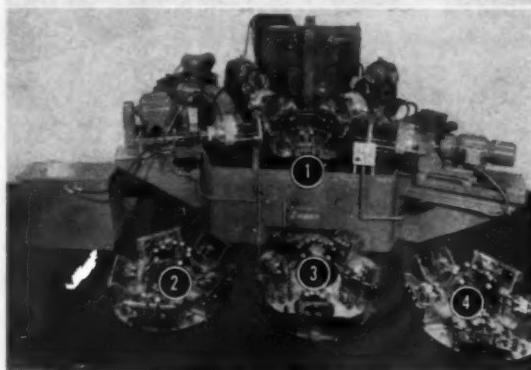
ARMSTRONG-BLUM MFG. CO.
5700 Bloomingdale Avenue • Chicago, Illinois





Four fixture assemblies, mountable on a common index table, have five stations each for drilling, reaming, and tapping left- and right-hand cylinders at 400 pieces per hour. In all, 2,900 holes are produced.

because
Zagar
*design uses more
 spindles in
 smaller space with
 minimum tooling
 and
 requires short
 change-over time*



Zagar gearless design permits flexibilities in building machinery with results not obtainable elsewhere. By using many spindles and tooling more parts in one machine, fewer units, less space, and little change-over time are required.

Gearless design allows close center hole production without changing spindle locations

in heads. Varying hole patterns can be obtained without additional heads. Interchangeable fixtures on the same index table, therefore, compound the potential hole production — in one basic unit.

Find out how Zagar can program your entire drilling, reaming, and tapping job by sending us a part for an engineering study.

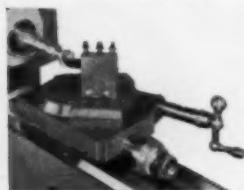
Zagar INCORPORATED
 23900 LAKELAND BLVD. CLEVELAND 23, OHIO
USE MORE SPINDLES TO DO MORE WORK

Use postpaid card. Circle No. 201

June, 1960

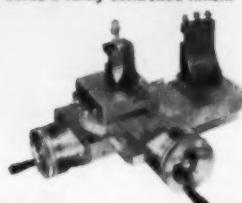


SOME OF THE MANY
COST-SAVING FEATURES



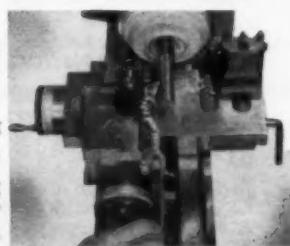
**RADIUS TURNING
ATTACHMENT**

Concave and convex surfaces are readily generated after a simple set-up with a direct-reading dial indicator. Worm gear feeding insures a finely controlled finish.



REAR SLIDE CUT-OFF

The rear tool station is an added feature to the traditional convenience and accuracy of the Wade Super Slide Rest. A cut-off tool may be left in readiness to avoid tool changing.



DIRECT READING DIALS

Large satin-chrome dials read directly in thousandths of an inch and are resettable to zero.

*Cut toolmaking costs
with a* **Wade**
#94 FINISHING LATHE

Every design feature built into the Wade Finishing Lathe has one aim in view: to make this machine the *most convenient and the fastest to use* for toolmaking and limited production. The Wade Model #94 has a 9" swing, 1-1/16" collet capacity and will accept 15" between centers.

Write for literature.

Sold by Pratt and Whitney Co., Inc. in most areas.

THE WADE TOOL CO.

WALTHAM 54, MASS., U.S.A.

MAKERS OF
PRECISION MACHINE TOOLS
FOR AMERICAN INDUSTRY

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General purpose
Roll-Marking
Machines



Rapid production
Roll-Marking
Machines



Precision
Graduating
Equipment



Mechanical and
Pneumatic Marking
Presses



Bench
Marking
Machines



Automatic
Numbering
Heads



Precision
Marking
Dies



Hand
Marking
Tools

Permanent INDENTED METAL MARKING

For over half a century Noblewest has been the leader in designing and building machines and tools for faster, better marking at lower production costs to users. Noblewest marking is permanent indented marking . . . good for the life of your product. Illustrated are the basic types of marking equipment in the Noblewest line. It includes machines for marking, graduating, embossing and serial numbering at production speeds up to 15,000 pieces per hour with full automation. Whatever you want to permanently mark, it will pay you to specify NOBLEWEST. Write for comprehensive catalog. Noble & Westbrook Manufacturing Company, 9 Westbrook Street, East Hartford 8, Connecticut.

A few desirable territories open to qualified representatives.

MARK IT BEST WITH

NOBLEWEST

NOBLEWEST
IMPROVED
MARKING
DEVICES

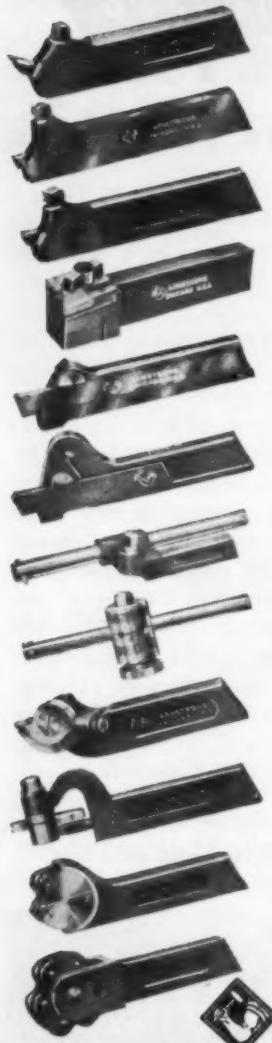
MARKING
NUMBERING
EMBOSSING
GRADUATING

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ARMSTRONG

TOOL HOLDERS

A Correct Tool for Every Lathe Operation



You can save time (and money) by ensuring that your machine tools are equipped with adequate numbers of the correct ARMSTRONG Tool Holders. The ARMSTRONG System of Tool Holders includes correctly designed tools for every standard operation on lathes, shapers, and planers, and for many operations on turret lathes and screw machines. By utilizing the ARMSTRONG System of Tool Holders, you can reduce tooling costs, eliminate down time in tooling up, operate your machine tools at maximum feeds and speeds.

ARMSTRONG Tool Holders are long-lasting tools. They are strong beyond need, handy and efficient, profitable to use, and are readily available from your local ARMSTRONG Distributor.

Check over your ARMSTRONG Tool Holder needs.
Write for literature.



If you do not know the name
of your local ARMSTRONG
Distributor, inquire when
asking for literature.

ARMSTRONG BROS. TOOL CO. 5208 W. ARMSTRONG AVE CHICAGO 46, ILL.

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Machine and Tool BLUE BOOK

WILLIAM F. SCHLEICHER, Vice President, Editorial Director; PAUL MELINE, Senior Editor; JAMES B. POND, Managing Editor; DARRELL WARD, Engineering Editor; MARGARET MOFFETT, Assistant Editor; WM. D. ENGSTRAND, Western Editor; VIC ERICKSON, Editorial Art Director; PATRICIA MCNEER, Readers' Service.

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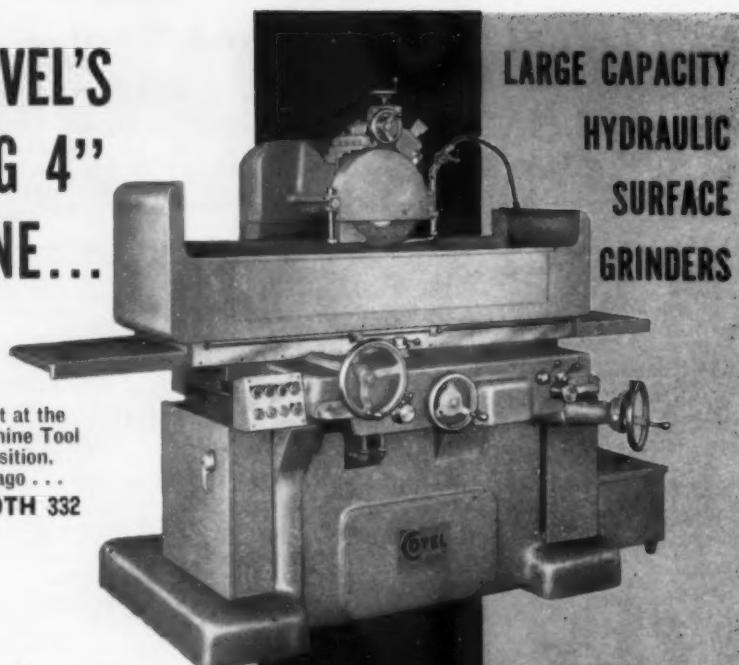
COVEL'S "BIG 4" LINE...

See it at the
Machine Tool
Exposition,
Chicago . . .

BOOTH 332

Yours — for no more than you would pay for ordinary machines—surface grinders that enable you to handle die grinding, jig and fixture grinding and production work fast and efficiently. These Covel Surface Grinders — with their hard chrome tableways and other top-quality features — assure you micro-precision performance at lowest possible cost. Your investment in a Covel will pay off many times over — ask any Covel owner.

LARGE CAPACITY
HYDRAULIC
SURFACE
GRINDERS



No. 35B
grinds work
 $8'' \times 24'' \times 18''$ high

No. 60
grinds work
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No. 60B
grinds work
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No. 80
grinds work
 $16'' \times 36'' \times 18''$ high



Micro-Precision a Covel Tradition -- Since 1874

BENTON HARBOR, MICHIGAN

**PRECISION
GRINDERS**

Write, wire or call TODAY for
complete information and
prices on the complete line
of Covel Precision Grinders.
Ask for Bulletin BB60.

Use postpaid card. Circle No. 206

MACHINE and TOOL BLUE BOOK

Finger Prints

Can't Be Faked!

To assure positive identification of your part or product, it should be marked with your trade name, serial or part number, inspection or code symbol, dates, etc. This essential identification can best be obtained *permanently* through steel stamp marking.

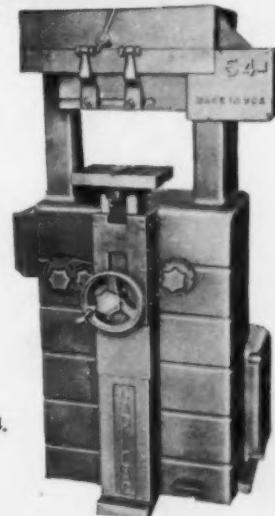


Engineered Marking by CADILLAC . . . cuts costs

CADILLAC NO. 54 HYDRAULIC MARKING MACHINE

Here a single pressure control regulates full range of pressures—marks round, flat and irregular surfaces. Can mark a very light legend into nonferrous metals . . . extremely deep legends into tough steels. It is ruggedly built and simple to operate.

Write for
Bulletin No. 54.



STAMAX* ROLL DIES

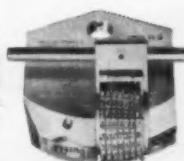
Developed by CADILLAC for the
REALLY tough marking job.



**SPECIAL STAMAX* CODE
INSPECTION STAMPS
AND SYMBOLS**

Hard and tough—won't mushroom, chip or split. Priced right.

CADILLAC MODEL NO. 32
Automatic Numbering Head
(Special Barrel Style Shown)
Perfect for consecutive numbering. Standard models available.



CADILLAC STAMAX*
MARKING DIES
... Guaranteed absolutely true reproduction of your requirements.



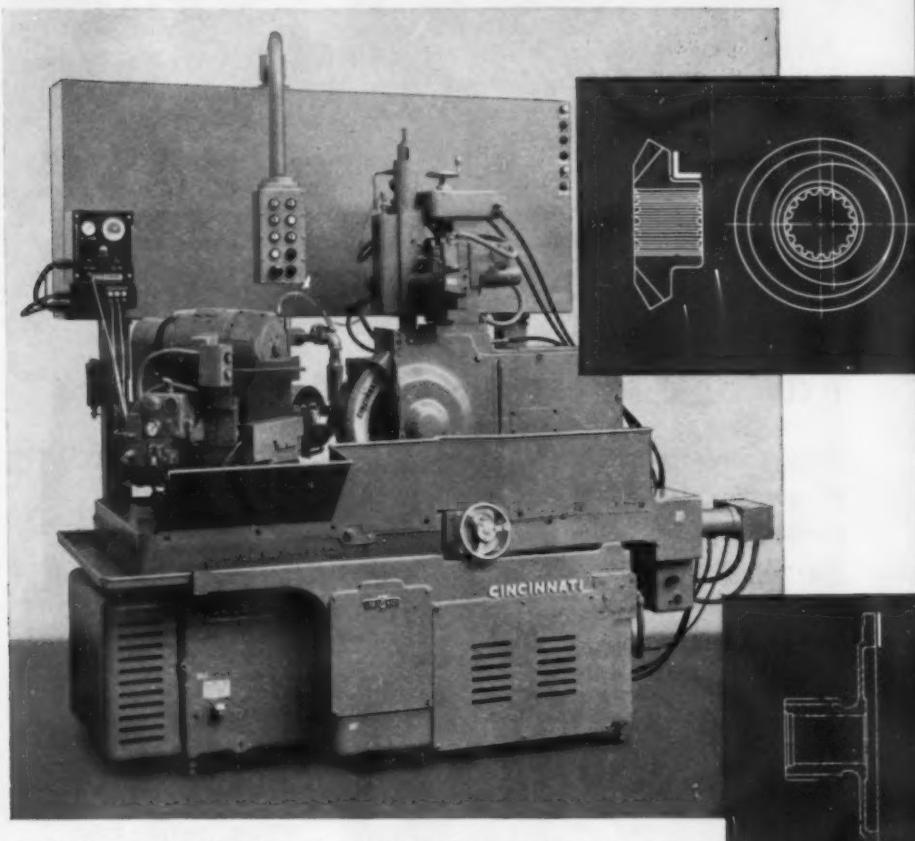
For further information regarding marking devices and equipment, write for Bulletin No. 41.

*STAMAX means.
Carefully selected alloys specially heat treated and tempered



CADILLAC STAMP CO.
17321 RYAN ROAD • DETROIT 12, MICH.
TELEPHONE: FOREST 6-0500

CINCINNATI COMBINES SUPERIOR



Production and quality are automatically controlled by the ingenious tooling and extra equipment, principally of standard design, on this CINCINNATI FILMATIC No. 2 Chucking

Grinder. These fine precision grinders are built in two sizes:

No. 1—Capacity 0" to 4" diam.
No. 2—Capacity 2" to 10" diam.
Catalog No. G-685-1.

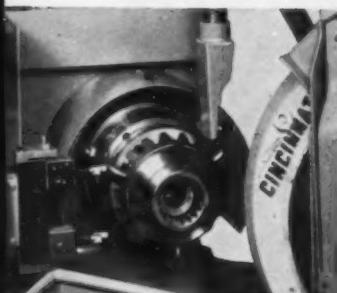


Booth No. 1034

BUILDERS OF PRECISION GRINDING MACHINES: CENTER-TYPE • CENTERLESS • MICRO-CENTRI
THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO



CHUCKING GRINDER PERFORMANCE with WIDE VARIETY OF TOOLING



Single-spindle headstock, automatic gage sizing, pneumatic chuck with interchangeable jaws for four sizes of parts.

Part Name . Bevel gear
Operation . Finish grind diameter, adjacent face, radius
Material ... 8625H steel
Production . 72 per hour



Two-spindle headstock, pneumatic diaphragm chucks, automatic truing, manual loading.

Part Name . Transmission gear
Operation . Grind face
Material ... Steel
Production . 94 per hour

Application of the chucking method of grinding is not always well defined. But Cincinnati Grinding Specialists know exactly when it should be used . . . they have the opportunity to weigh it against the centertype and centerless methods. In shops throughout the country, manufacturing lots of several hundreds or thousands can be ground at the lowest cost on CINCINNATI FILMATIC Chucking Grinders.

These fine precision grinding machines are built with single-spindle or two-spindle headstock. They can readily be tooled up with a wide range of positive chucking and work loading arrangements and other highly productive features such as . . . manual or push-button profile truing; automatic cross feed compensation; crush truing; automatic gap eliminator; automatic air-electric gage sizing.

The machine itself incorporates many feature-advantages of long productive life and accurate performance, such as FILMATIC grinding wheel spindle bearings; variable-angle headstock positioning; extra sensitive automatic dual rate infeed; two-speed cross slide handwheel; super-accurate headstock spindles. On applications where it can be applied the chucking method of grinding is superior . . . for accuracy, high production, low cost.

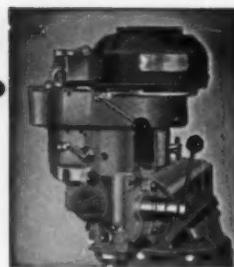
Complete specs for CINCINNATI FILMATIC Chucking Grinders are in catalog No. G-685-1. Write today for your copy.

ROLL • CHUCKING • CENTERLESS LAPING

CINCINNATI
GRINDING MACHINE DIVISION

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June, 1960



variable speeds **60 to 3300 r.p.m.**



TREE 2UVR VERTICAL MILL

Spindle speeds infinitely variable from 60 to 3300 r.p.m. make the 2UVR Vertical Mill useful for a wide range of work not heretofore accomplished by mills of this size. Exclusive features include:

- Roller Spindle Drive
- Automatic Collet Closer
- Head to Ram Mounting
- Power Table Feed and Rapid Traverse
- Turret Locking Mechanism



For full information write,
TREE TOOL & DIE WORKS
1600 JUNCTION AVE., RACINE, WIS.

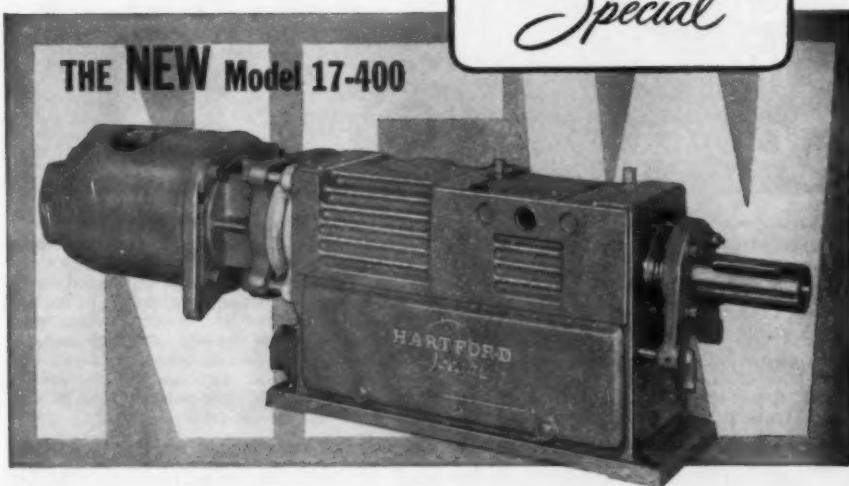
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MACHINE and TOOL BLUE BOOK

ANOTHER "BUILDING BLOCK" BY

HARTFORD
Special

THE NEW Model 17-400



AIR HYDRAULIC DRILL UNIT

- 4" STROKE • UNITIZED • SMALL SIZE
- INTEGRAL AIR VALVE • FIELD TESTED

COMPLETE INFORMATION...on the new Model 17-400 Drill Unit, including dimensions, specifications and other engineering data, is covered in Circular No. GC-400. Write now for your free copy. The Hartford Special Machinery Co., 3200 Homestead Ave., Hartford 12, Conn.



HARTFORD
Special

THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD 12, CONNECTICUT

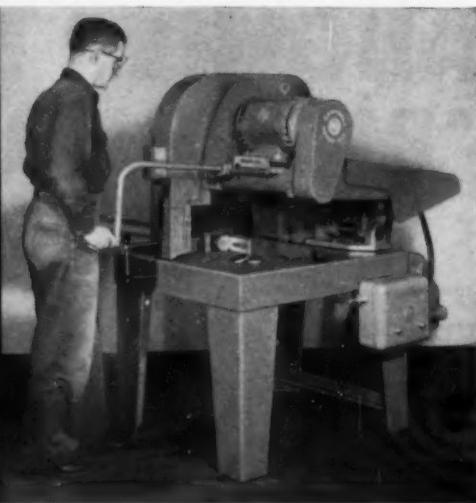
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June, 1960

11

NEW!

GREATEST CUT-OFF CAPACITY IN ITS CLASS!



• This newest addition to the Sever-All line of abrasive cutting machines—the Model 2-A—provides greater cutting capacity and more flexibility than any other machine in its class. Check these important advantages:

Big capacity • cuts 4" round or square solids, 6" diameter tubing or standard pipe, 6"x1" flat stock, 6" angle iron and 8" channels. Cuts practically all metals.

Fast operation • accurate cuts at 2 to 3 seconds per square inch. **Power oscillation** • oscillation is the forward and backward motion of the cutting wheel as it is fed down into the cut. It provides extra cutting capacity, longer wheel life, cooler cutting and reduced operator fatigue. **Quality cuts** • clean, smooth cuts, require little or no finishing operation. **Economy** • Sever-All wheels, developed especially for the Model 2-A, provide lowest cost per cut.

VARIETY OF WORK HOLDERS GIVES UNUSUAL VERSATILITY



• Choose the work holders you need from several optional arrangements. These include the vise-type holder shown on the ma-

chine at top, plus the V-block, angle-cutting and 2-way clamp fixtures above. Screw-type and quick-action clamping interchangeable.

Write for details on the new Model 2-A Sever-All abrasive cutting machine. Ask for Bulletin DH-299

SEVER-ALL ABRASIVE CUTTING MACHINES

Allison-Campbell Division, American Chain & Cable Company, Inc.

937 Connecticut Avenue, Bridgeport 2, Conn.

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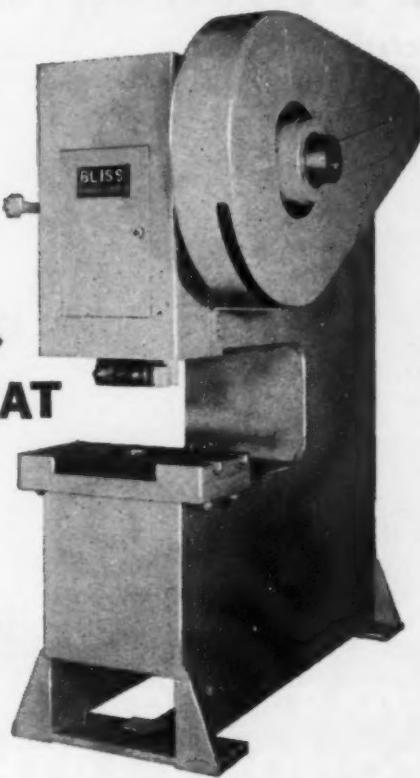


MACHINE and TOOL BLUE BOOK

NEW
line of
Bliss presses
featuring

DEEP THROAT

All moving
parts are
interchangeable
with standard
inclinables



Rugged, compact, these reinforced welded steel frame presses are designed to give maximum rigidity and minimum "spring" under load.

All moving parts enclosed for greater safety—yet instantly accessible for adjustment. Probably most important is that these parts are standard Bliss inclinable press parts. This means you can be sure of quick parts service wherever you're located!

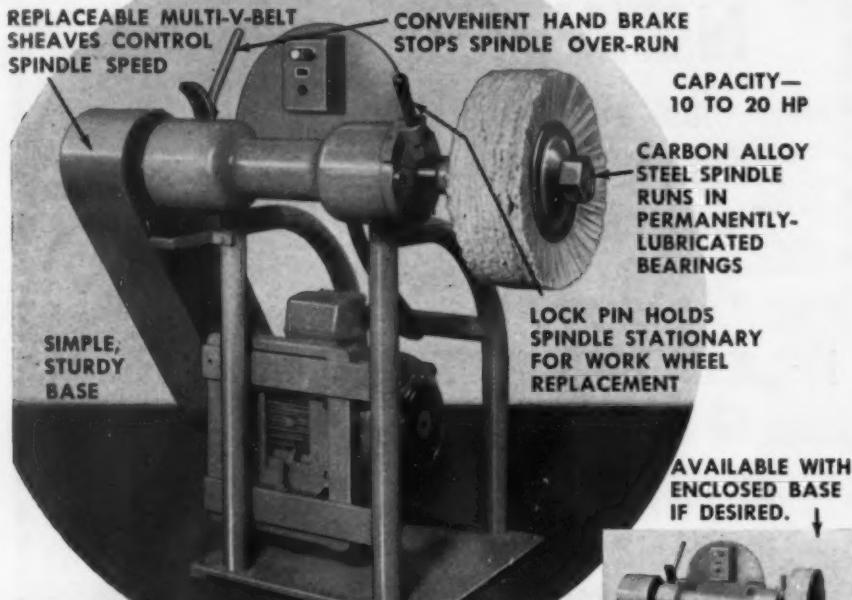
Sizes range from 4-ton bench models with a 12" throat to a 60-ton press with a throat almost three feet deep. You can also have extended bodies, mechanical or air friction clutches, automatic lubrication, other features. Why not write for details.

BLISS
SINCE 1857

is more than a name . . . it's a guarantee!
E. W. BLISS COMPANY • Canton, Ohio

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LOW COST, Buffing, Polishing, Deburring



Murray-Way's NEW ECONOMY LATHE!

This new lathe has all the essential features of an expensive, top performance lathe at only a fraction of the cost. All unnecessary "frills" and usual inside base adjustments have been eliminated, leaving a top quality spindle mounted on a simple, sturdy, stanchion type base.

Husky, permanently-lubricated bearings on wide centers assure maximum service life and ample work pressure support. Width between wheel flanges is 6", greater widths available if desired. Arbor sizes 1½" to 2". Floor area 43" x 34".

Write for illustrated literature and prices.



MURRAY-WAY CORPORATION

P. O. BOX 180 • MAPLE RD. EAST
BIRMINGHAM, MICH.

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MACHINE and TOOL BLUE BOOK

A million tons of cutting experience build performance into LADISH Saw Blades

When you buy Ladish blades...you get the added advantage of experience gained in cutting over a million tons of a broad range of metals...experience that means you will get sustained cutting efficiency, long, dependable blade life, and more cuts per dollar.

On your next requirement...buy Ladish blades...the complete, quality line marketed by one of the largest users of saw blades.

LADISH CO.

Cudahy (Milwaukee Suburb), Wis.

**PROVE TO YOURSELF THE ADDED LIFE
AND CUTTING EFFICIENCY
OF LADISH BLADES**



HANDY POCKET SIZE CUTTING GUIDE AND CATALOG

Contains answers to cutting problems. Provides quick reference to saw blade specifications. Write for Bulletin 578.

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June, 1960



COMPLETE LINE OF TYPES AND SIZES

AMPLE STOCKS • EFFECTIVE PACKAGING
CONSULTATION SERVICE ON CUTTING PROBLEMS

LADISH CO., Cudahy, Wisconsin

Please send me without cost or obligation the
Ladish Handy Pocket Size Cutting Guide and Catalog.

Name _____

Title _____

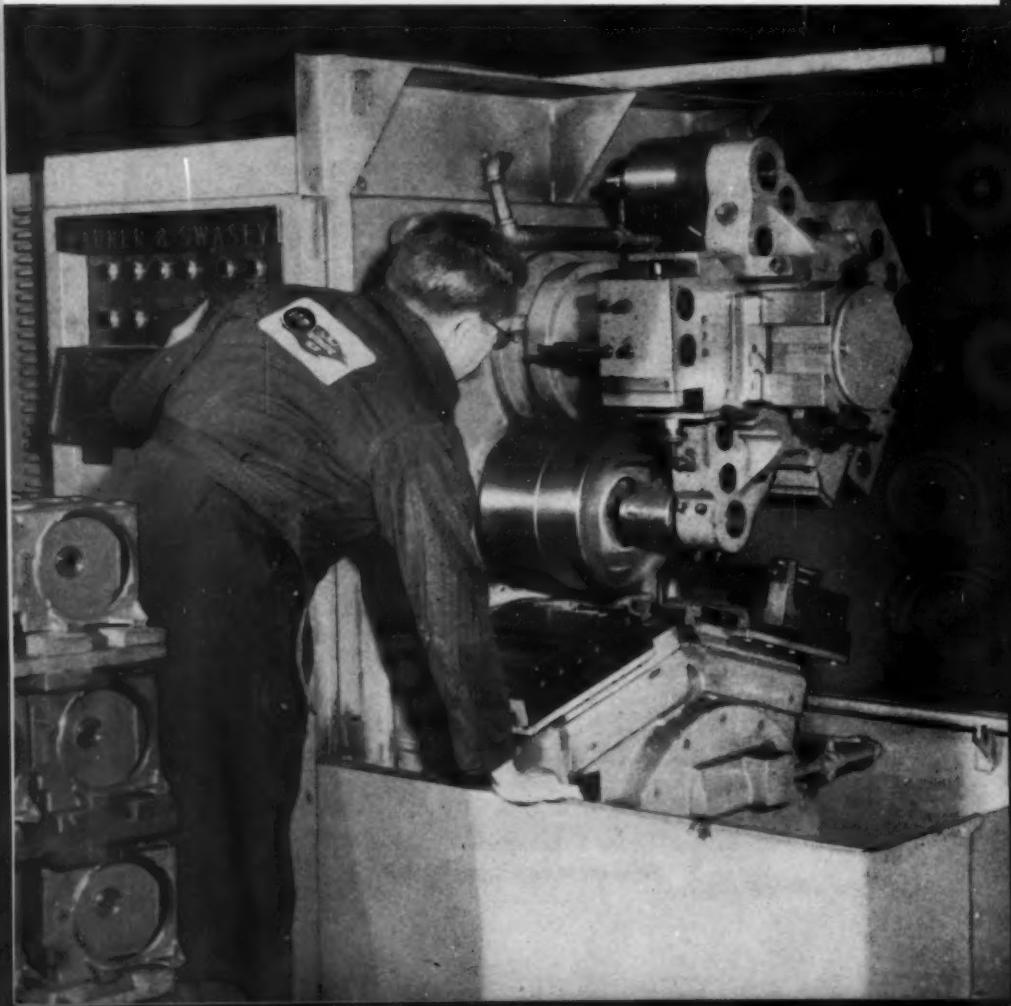
Company _____

Address _____

City _____ Zone _____ State _____

General Machine Co. replaces 30-year old turret lathe with Warner & Swasey 2AC Single Spindle Chucking Automatic to cut manufacturing costs on gear cases and covers, and to keep bids competitive on subcontract work.

SEVEN OPERATIONS REDUCED TO TWO!

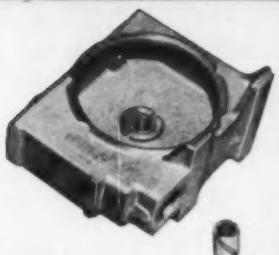


To maintain an acceptable profit margin on their product components as well as keep subcontract bids competitive—much of it on small lot work—General Machine installed a new Warner & Swasey 2AC Single Spindle Chucking Automatic.

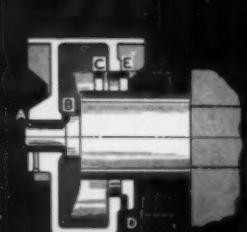
Because of the 2AC's unique overhead turret design, which houses both turret and spindle bearings in the same temperature zone, problems of spindle rise are eliminated. As a result, General's shop people found they could easily hold

single point boring tolerances of .0006 on a day-in-day-out basis.

This repetitive accuracy plus the 2AC's unique versatility and ease of tooling permitted coal stoker gear cases and covers to be machined complete ready for paint in just two operations—one chucking for each part—including pressing-in and finish boring a bronze bushing. Previously seven operations were required—two machining, two arbor press, assembly of cover to case, line ream and disassembly.



Lot sizes range from 100 to 300 pieces on this gear case. Note how radial alignment of bushing is accomplished in STATION 4.



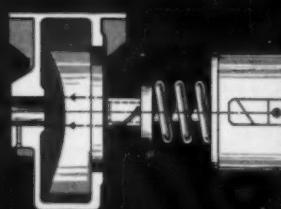
STATION 1. (A) Rough bores (B) Slab faces (C) Rough bores (D) Slab faces (E) Chamfers at 45°.



STATION 2. (A) Finish bores (B) Finish faces (late rear cross slide pushes turret mounted slide tool after (A) is completed).



STATION 3. (A) Finish bores (B) Chamfers at 45°.



STATION 4. Presses bushing. NOTE! Bushing loading tool is picked up and rotates with the fixture as it feeds forward establishing correct radial relation between bushing and gear case.



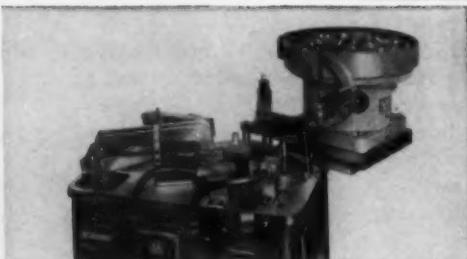
STATION 5. (A) Finish bores the bushing.

You can produce it better, faster, for less
with a **WARNER & SWASEY**

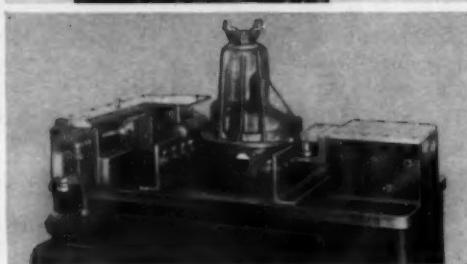




LEFT: Model 385, with remote hydraulic unit, marks inner and outer surfaces of bearing races at rate of 2000 per hour.



UPPER RIGHT: Model 135-S, with hopper feed and air ejection, is fully automated to mark 1800 to 2400 transistor cans per hour. Marks both top and sides.



LOWER RIGHT: In line Model 465, with serial numbering head, marks date and consecutive serial number on 1200 gear carriers per hour. Equipped with conveyor type fixture.

BETTER MARKING — LOWER COST MARKING ...WHEN YOU MODERNIZE WITH GTS

Illustrated are typical GTS, *special purpose*, marking machines. Modern GTS machines can deliver a "Sunday punch" to your production marking bottlenecks. Used to replace obsolete methods, they can cut your direct production costs.

You can have flexibility, *built-in*, to mark more parts—do more marking on parts, with uniform easy-to-read impressions.

GTS machines prolong marking tool life, lowering your tool costs.

GTS experience *can solve* your marking problems. Let our Marking Engineers help you determine the *best methods* for you.



For sharp impressions and long-run economy, always specify GTS Marking Tools.

WRITE FOR COMPLETE CATALOG or PHONE EA 7-0300

GEO. T. SCHMIDT, INC.

1-82 W. Belle Plaine, Chicago 13, Illinois

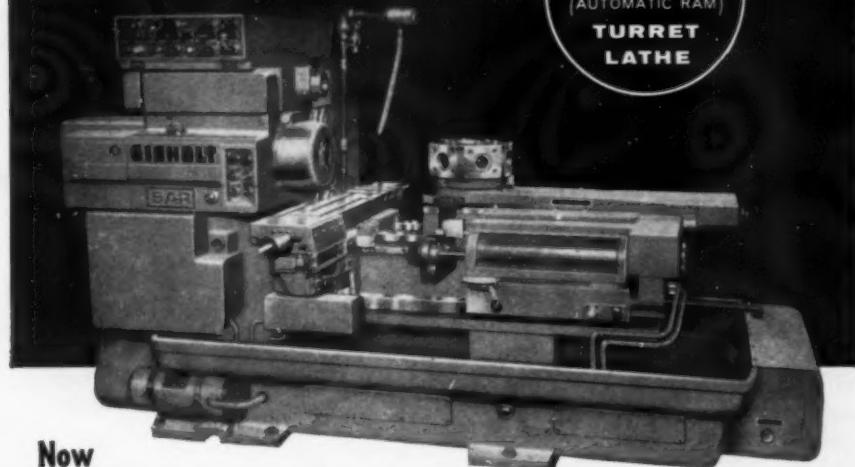
IF IT'S WORTH MAKING, IT'S WORTH MARKING

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ANNOUNCING

the new **GISHOLT**



Now

one machine does both bar and chucking work...automatically

Here is a ram-type turret lathe "gone automatic." It's the new Gisholt MASTERLINE AR. It handles both bar and chucking work. Changeover takes less than 1 hour. But that's not all. It combines the efficiency and consistent production of an automatic with fast setup and versatility. Yet, the new AR costs very little more than a hand-operated turret lathe!

For long runs or small lots. Whether you are now using automatics for long runs, or standard ram-type turret lathes for small lots, you'll want to evaluate this new development in automatics. You will quickly see how the new AR will cut your costs. Based on productivity, capacity, versatility, dependability, ease of operation, setup speed and original cost,

you'll find it's a new best buy for your equipment dollar today!

Ask for desk-side demonstration. Your Gisholt Representative will gladly explain the cost-cutting features of the new AR and show you how it can boost profits for you. Ask for your personal, desk-side demonstration or write for literature.

Investigate Gisholt's Extended Payment and Leasing Plans



GISHOLT
MACHINE COMPANY

Madison 10, Wisconsin

Turret Lathes • Automatic Lathes • Balancers • Superfinishers •
Threading Lathes • Factory-Rebuilt Machines with New-Machine Guarantees

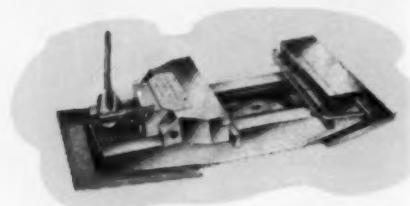
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You get day - in
with J & S

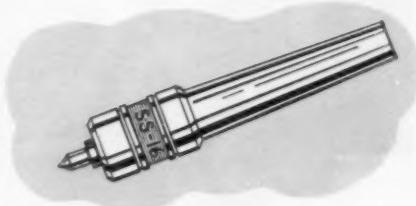
J & S CLAMPCUT SWIVEL VISE

Highly versatile milling machine vise with all the features which permit faster operation, fewer rejects, more man-hours saved.



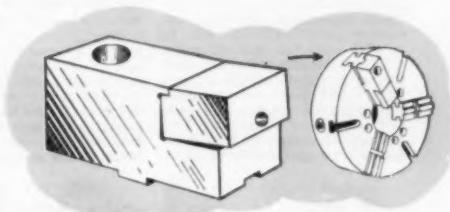
SUPER SENSITIVE SS-16 LIVE CENTER

For grinders and lathes. Designed to handle the smallest parts with highest precision. Non-friction center is free to rotate at the slightest touch.



DOWN-HOLDING LATHE CHUCK TOP JAWS

With expendable soft inserts. Cheaper jaws to be used up; thrown away. Provide tighter clamping for parallel machining work. Mount on any American Standard Lathe Chuck Master Jaw.



day - out economy precision - crafted products

J & S CLAMPCUT SWIVEL VISE FOR BETTER MILLING

With all the features for faster, better milling, this modern swivel vise is available in a complete range of sizes. Low, flat mounting, extra jaw depth, trigger stop for rapid opening and closing, multiple downholding clamp action, self-cleaning snap-on parallels for fast load-unload, plus positive chip escape and coolant return are among the advantages of this versatile J & S Swivel Vise which holds on any angle, holds rounds and allows extra height.

SS16, J & S SUPER SENSITIVE LIVE CENTER

One of the stars of J & S' complete live center line, the SS16 is designed to handle parts with .100" diameter and smaller. It has triple non-rubbing seals and H.S.S. points. The non-friction center rotates at the slightest pressure, is hardened and ground throughout.

UNIQUE DOWN-HOLDING LATHE CHUCK TOP JAWS

These new J & S jaws are another of the forward steps in modern methods of securing workpieces to machine tools. The soft expendable inserts mean cheaper jaws which can be used up and thrown away. They provide more rigidity, accuracy and parallelism; they clamp tightly and hold down a workpiece to a stop for utmost accuracy in machining work parallel.

Literature and data on request.

J & S TOOL CO., INC.

882 DORSA AVE., LIVINGSTON, N. J.

WYman 2-3181

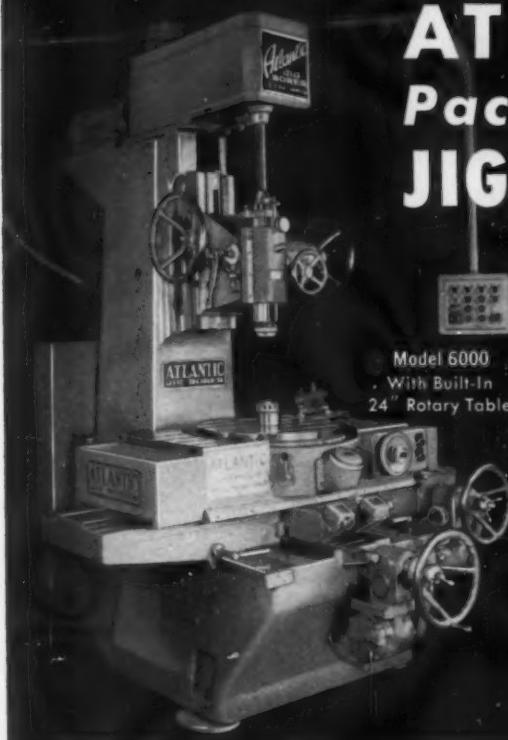
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PRECISION — SPEED — UNIFORMITY

ATLANTIC

Pace-Setting

JIG-BORERS



Model 6000

With Built-In
24" Rotary Table

Modern tool room jig-boring techniques require equipment that is adaptable to a wide range of applications — applications that demand a variety of speeds to guarantee ultimate efficiency and accuracy on every job. The Atlantic Jig-Borers have been designed, engineered and built to deliver every benefit of precision . . . speed . . . and uniformity under exacting, tool room conditions. Jigs, fixtures, molds, dies, gages, special machinery from A to Z, from aluminum to zinc, in every manufacturing process requiring the jig-boring of metal, the Atlantic Jig-Borers offer rugged dependability to micro-tolerances.

The ten-thousandths tolerances easily obtained with Atlantic Jig-Borers offer industry an opportunity for precise location and boring at real, money making economy. Many machines costing thousands more do not offer nearly as much. It is the outstanding value in the jig-borer field.

Write for free information and catalog on all available Atlantic Jig-Borers.



Model 4000



Model 5000



Model 6000



Model 7000

5 MODELS AVAILABLE IN TABLE SIZES RANGING FROM 12" x 18" - 24" x 50"
NUMERICAL SYSTEMS AVAILABLE ON 6000 AND 7000 SERIES MACHINES

ATLANTIC MACHINE TOOL WORKS
NEWINGTON, CONNECTICUT

SEE US AT THE SHOW — BOOTH 543
NATIONAL MACHINE TOOL BUILDERS ASSOCIATION

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SAVE DOLLARS ON PRODUCTION



With Engravograph, the illustrated part (spring steel) was profiled, contour milled and drilled in one operation, eliminating expensive tooling, multiple operations on costly equipment.

MAKE IT IN A FRACTION
OF THE TIME
using unskilled
labor.

SAVE DAYS ON DELIVERY

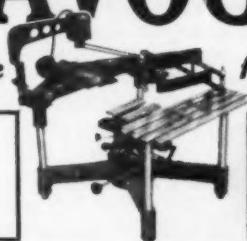


With Engravograph, any nameplate, panel or tag can be engraved right in your own shop, thereby eliminating unnecessary sub-contracting.

MAKE IT WHEN
YOU NEED IT
using unskilled
labor.

ENGRAVOGRAPH

the one machine for 1001 jobs

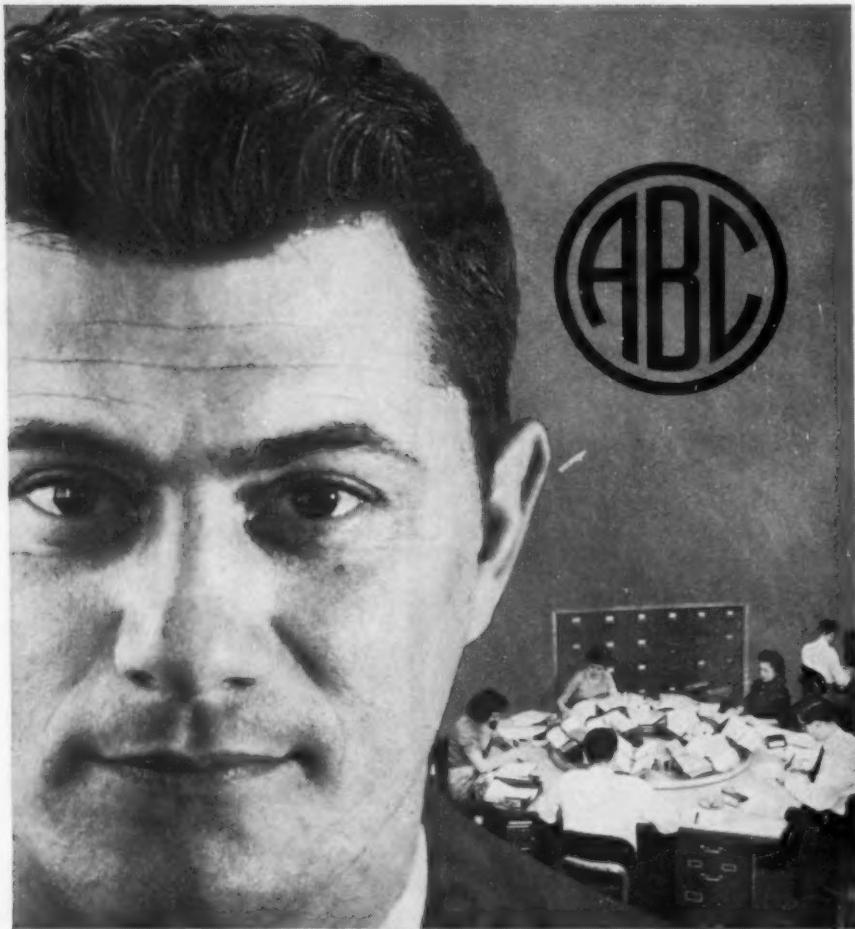


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28-page catalog MM-4.

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June, 1960

new hermes
ENGRAVING MACHINE CORP.
154 West 14th Street,
New York 11, New York.



why you get ABC drill jig bushings faster

My name is Lou Martz. It's possible some of you may know me by name—for many of our ABC Bushing customers phone in their orders. That's my job—handling your telephone and mail orders. • There are several of us at the Accurate order desk. We see to it that your orders are filled fast—and accurately. In many cases, orders are shipped the same day we get them. • We like our jobs and we like being able to give you better bushings—faster. • Give us your order, today, and let us prove to you that ABC Drill Jig Bushing service is the best—you'll become an ABC enthusiast, too. • Write for Catalog B-58.



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444 North Avenue, Garwood, New Jersey

ASA Standard Drill Bushings • Precision Parts • Lift-Swing Drilling Fixtures

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MACHINE and TOOL BLUE BOOK

FIRST TIME EVER!

CONVENTIONAL
TWIST DRILL
frequently produces
long, stringy,
unmanageable
chips

END
VIEW



PATENT APPLIED FOR

"LO-TORK"



CHIPS CURL
AND BREAK
INTO SMALL
PIECES AS THEY
CONTACT
"LO-TORK" CHIP
BREAKER GRIND

END VIEW



Unretouched photos demonstrate "LO-TORK" Drill's
chip breaking effectiveness. Conventional drill at left;
"LO-TORK" at right. Same workpiece in each photo.

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a chip breaking
drill that actually
improves cutting action
lengthens tool life!

CHICAGO-LATROBE "LO-TORK" CHIP BREAKER DRILL

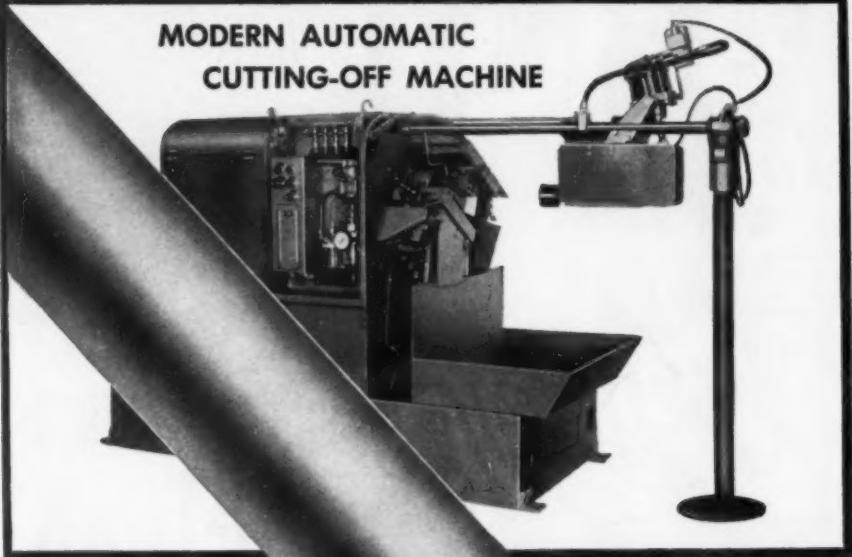
The tips on the two drills above show how "LO-TORK" Chip Breaker Drills work. A new convex shape has been engineered into the flutes. Chips meet this shoulder and are reduced instantly to manageable size without sacrificing any of the efficiency of the tool's point. At the same time the tool produces extra benefits as follows:

1. Improved lubrication at drill point.
2. Uninterrupted deep hole drilling.
3. Faster feeds.
4. Longer tool life.
5. New safety for operators.
6. Quick, easy regrinds.
7. Less power required.
8. Improved plant housekeeping.

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OR CIRCLE NUMBER FOR FREE BOOKLET.

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418 West Ontario Street, Chicago 10, Illinois

MODERN AUTOMATIC CUTTING-OFF MACHINE



Fast cut-off in lengths from a fraction of an inch to several feet with micrometer accuracy. Handles any length of stock and cuts any material that can be turned—bar stock up to 3" O.D.—tubing up to 8" O.D. Will cut-off, form, groove, flange and chamfer in a single operation—at a high rate of speed.

**CUTS TUBING,
PIPE AND
BAR STOCK
FAST**



WRITE for CATALOG

Describes all models. Complete specifications. Shows automatic bar feeder that handles entire load of stock with no operator attention, even with random lengths. Also, hot spinning machines and Safety Drill Tables.



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MODERN MACHINE TOOL COMPANY
JACKSON, MICHIGAN

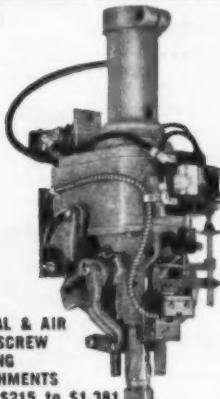
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HOW TO TAP UP TO 5,000* SMALL PARTS PER HOUR WITH PRECISION AND AT LOW COST...

WITH THE JARVIS AIR-OPERATED AUTOMATIC

LEADSKRU-MATIC

CHANGE PITCH IN SECONDS WITHOUT CHANGING LEAD SCREW



MANUAL & AIR
LEAD SCREW
TAPPING
ATTACHMENTS
FROM \$215 to \$1,381

LEADSKRU-MATIC FEATURES WORTH YOUR INVESTIGATION

1. Adjustable Pitch — Change pitch in seconds without changing lead screw.
2. Exact thread depth control.
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11. Fits any Drill Press.
12. Available with fixed or multiple spindle heads.

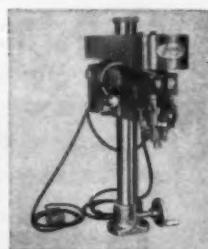
VOLUME PRODUCTION WITH PRECISION. This Air-Operated, Automatic Lead Screw Tapping Attachment converts your drill press into an extremely accurate tapping machine capable of volume production.

***5,000 SMALL PARTS PER HOUR.** Using the LEADSKRU-MATIC as the basic machine, one of our customers built a small parts tapping unit comprising table, hopper feeds, holding fixtures, controls, etc., which taps up to 5,000 nut blanks per hour... **AUTOMATICALLY.** And at a lower cost than less versatile tapping machinery!

SHORT OR LONG RUN VERSATILITY. Besides the deluxe, air-operated, adjustable pitch model shown at left, you have, according to your requirements, a choice of electrically driven, manually operated adjustable pitch tapping attachments, or conventional single pitch units. No need to pay for extra features or parts that your jobs do not require.

JARVIS AUTOMATIC, AIR-OPERATED LEAD SCREW TAPPER ADAPTABLE TO DRILL PRESS TABLE

Where complete automation is not desired, machine is equipped with standard hand-operated model lead screw units.



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To: Jarvis Corporation 40 Pease Ave.,
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Have Rep. call Send Lead Screw Cat.

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Company

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City & State

Jarvis CORPORATION

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Co-form X-PRESS TAPS

Manufactured under license from Besly-Welles Corporation

for tapping threads without cutting



NOW — from HY-PRO you can get the newest in tap design — **Co-form X-PRESS** fluteless taps that are setting cost-reduction records on many jobs that were formerly "tap-killers".

HY-PRO Co-form X-PRESS taps cold-form threads in through or blind holes, with these advantages . . .

No Chips to clog and cause tap breakage — no chip removal problems • **Permit Faster Tapping Speed** and boost production from automatic equipment **Provide Accurate Control** of hole size — cannot be forced into lead error • **Eliminate Blind Hole Tapping Problems** — no chips to jam at bottom • **Form Stronger Threads** with better holding power • **Taps Are Stronger** without flutes, especially in smaller sizes **Taps Last Longer** and maintain accurate size tolerance **More Holes Per Tap** — up to 40 times greater tap life.

Tap for less with Co-form® X-PRESS®

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Recommended for tapping . . .

Copper Brass Lead
Aluminum Zinc
Steel Magnesium
Die Castings
Leaded Steel
Stainless Steel
— other ductile metals

Tapping operation is the same

Conventional methods and equipment are used, except for change to larger tap drill sizes.

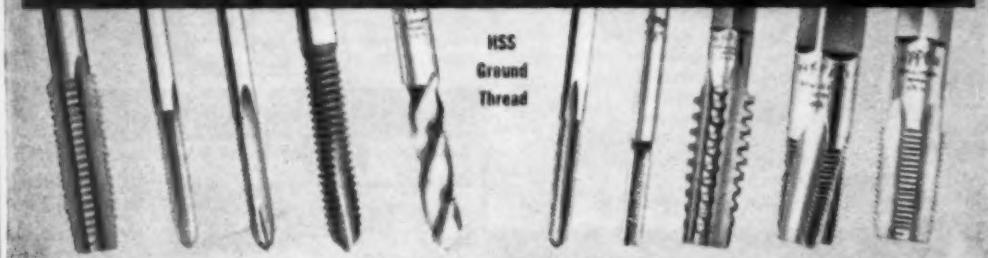


STANDARD TAPS



FROM STOCK

for "most holes per tap" — in any material



Hand and Machine Screw

Spiral Point

Fluteless
Spiral Point

Spiral Flute

HSS
Ground
Thread

Special
Application

Pulley

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Taper Pipe
Spiral Flute

Spiral Flute

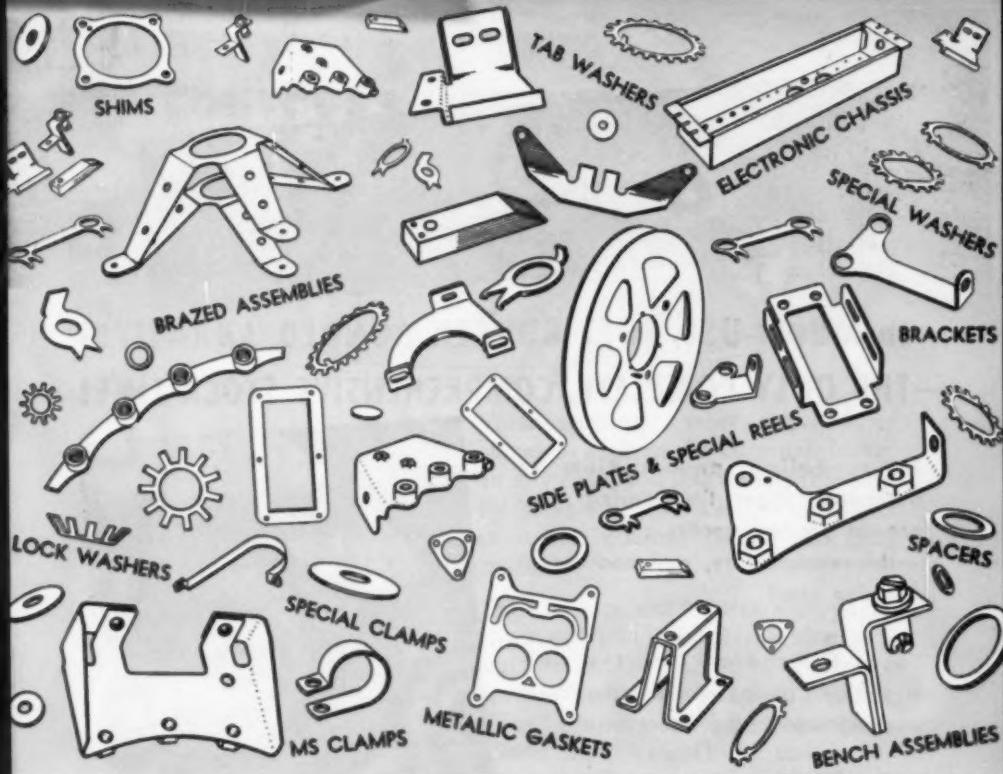
Hy-pro Tap Engineering Specialists will help you find out quickly how much you score on "cost per tapped hole." Their job analysis regularly leads to savings of 50% or more — often with a simple switch

to the right style of standard taps. Write for complete information. Find out how much you can save.

For standard taps from stock, call your local **Hy-pro Tap Distributor**.

HY-PRO TOOL COMPANY

NEW BEDFORD, MASS., U. S. A.



You name it... we'll stamp it one or a million @ minimum cost

You'll get better service on Stampings from THE LAMINATED SHIM COMPANY. This is literally true because (a) we've been doing it since 1913, and (b) we've perfected our own special equipment, tooling and techniques—all unknown to

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1 "ONE PLUS" METHOD

Applies when you need just a few pieces for prototypes or experiment. We hold all critical dimensions, yet avoid tooling charges.

2 SHORT RUN METHOD

More than "a few," but less than production quantities. Temporary tooling, simple dies and special presses keep costs down.

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Applies when quantity, tolerance, size and contour factors justify our standard production tooling and/or nominal die charges.

4 "WATCH DOG" SERVICE

A routine procedure. We re-evaluate repeat orders as to quantity and space—then use the Method best for you.

Stampings

DIVISION • THE LAMINATED SHIM COMPANY, INC.

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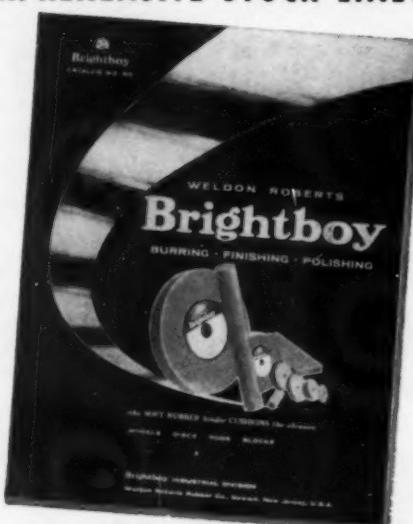
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The revealing, new medium for achieving bigger time savings, improved product quality . . . —the revolutionary, new concept of abrasive uses!

Yours for the asking, the new Brightboy Catalog contains the latest working data, and product listings . . .

- Brightboy sizes, grains, textures, machine speeds, on all 49 readily available 'Job Matched' stock compounds for machine and manual operations
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- refreshing, new methods and applications



No plant working in metals, wood, plastics or laminated materials should be without this new reference catalog outlining the exceptional advantages of rubber-cushioned abrasives. Write for it.



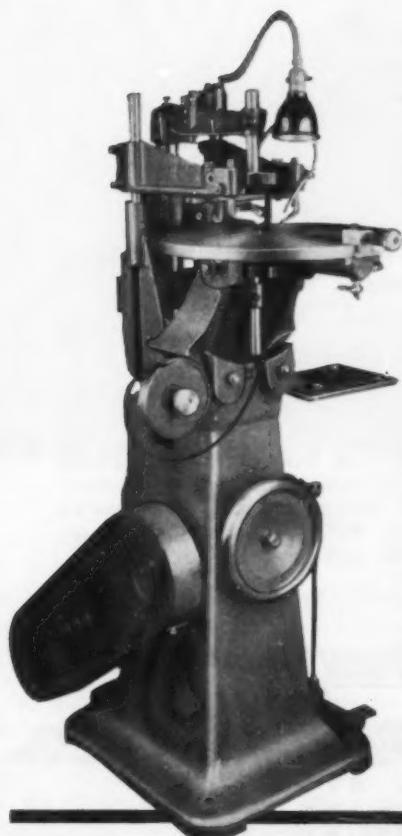
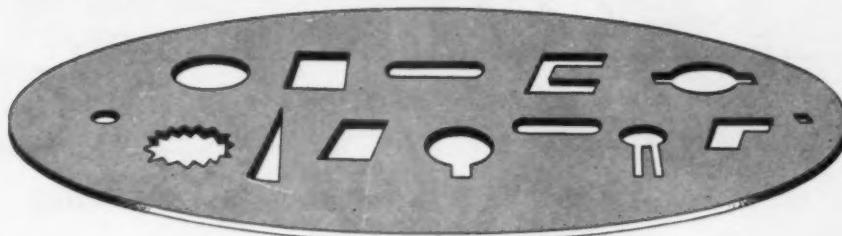
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WELDON ROBERTS RUBBER CO.
95 North 13th Street Newark 7, N. J.

America's Pioneer Manufacturer of Rubber Bonded Abrasives

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FOR CONTOURS LIKE THESE . . .



Freak contours — more conventional shapes — internal or external forms. In any case, you'll save valuable time by producing the job on an Oliver or Adrian contour sawing and filing machine.

Parts for jigs and fixtures, dies, gages, templates and special machine production can be shaped to dimension faster — easier — at less cost. No hand filing or semi-finishing operations. Better investigate Oliver today. Just write. Available in five sizes — bench or pedestal.



OLIVER of ADRIAN
OLIVER INSTRUMENT COMPANY

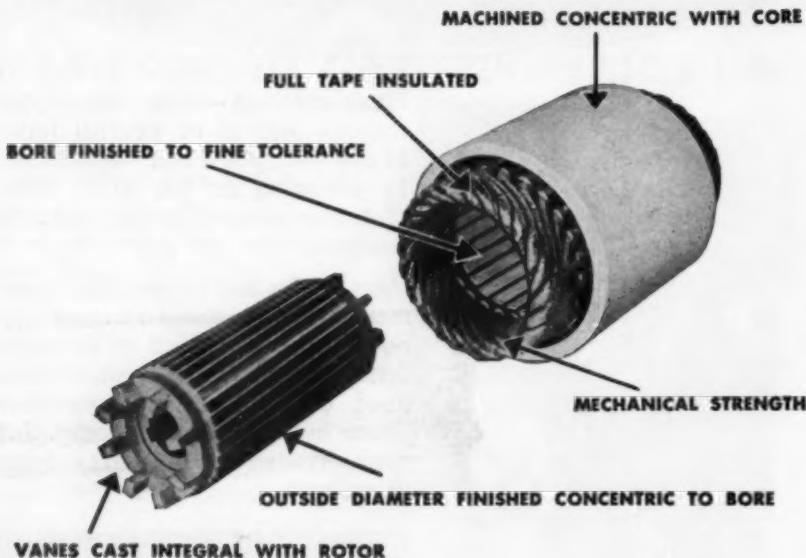
1408 E. Maumee St. • Adrian, Michigan

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Serving the Industry Since 1852



WOODS SHAFTLESS MOTORS



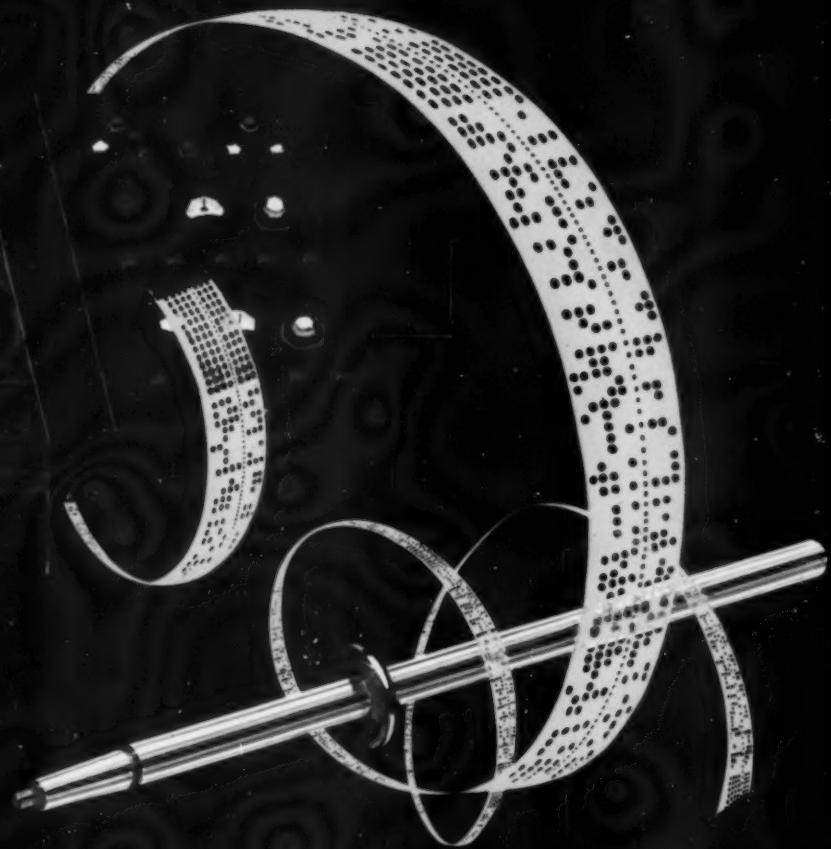
The application of direct motor drive with WOODS' Shaftless Motors to high-speed spindles brings the peak of motive efficiency at relatively small cost. Conserves space—eliminates belts and gears—fewer wearing parts. The extensive and varied lines of WOODS' Shaftless Motors are available for nearly every class of direct application.

Let us tell you how you can achieve a reduction in production costs by direct motor drive.



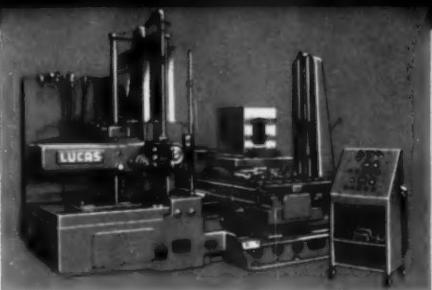
S. A. Woods Machine Co.
27 DAMRELL STREET
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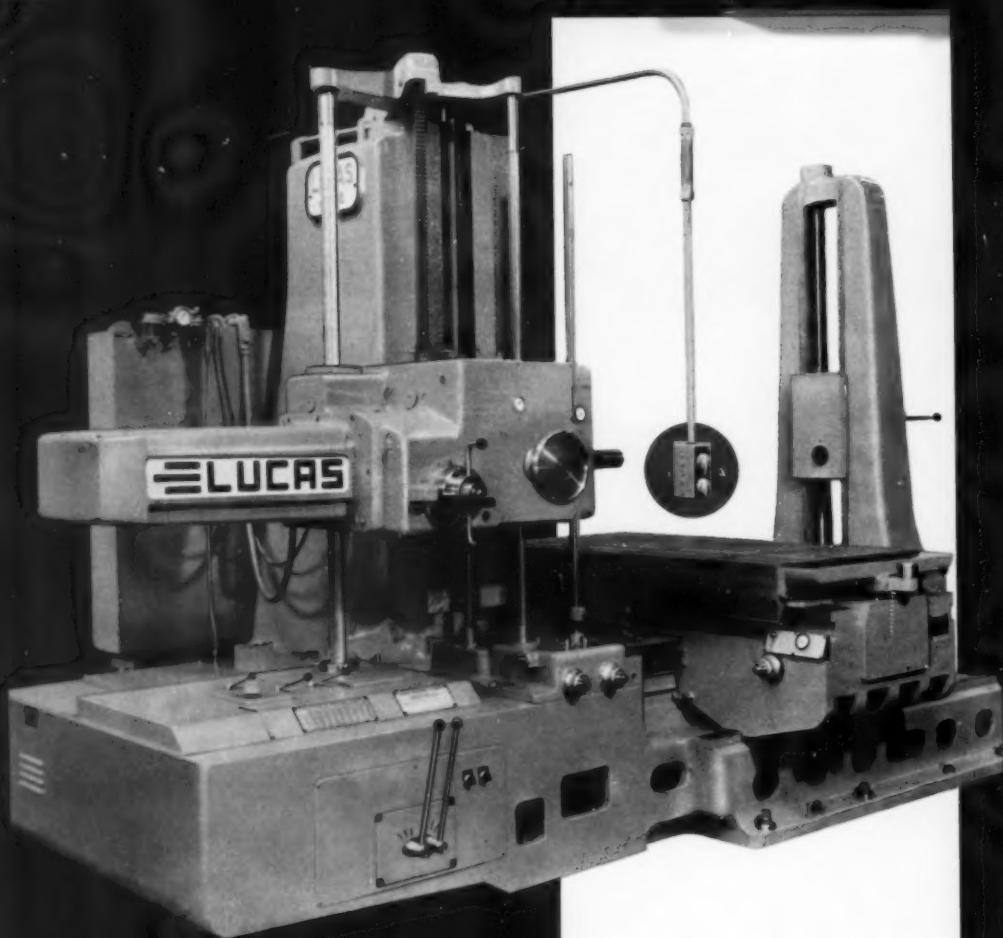


Tape control... certainly!

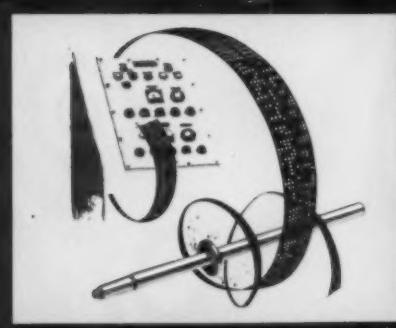
Tape control can readily be applied to any Lucas model, (2-3/4" to 6" diameter spindles) if repetitive operations or complicated one-of-a-kind jobs make this new development advantageous. Lucas tape controlled machines are available with punched tape for N.P.C., magnetic tape for contouring, or tape and tracer control. If you have a profitable use for *any* type or size of horizontal boring, drilling and milling machine (up to 6" spindle capacity) you can get it at its best from the specialist in this type of machine. *Did you ever meet a man who regretted picking a Lucas?*



LUCAS
OF CLEVELAND



Simplified pendant controls ...



A Lucas performs the greatest variety of operations possible in any machine tool. Standard models permit control of *all* operations from the pendant. Optional pendant and lever control machines, like the one shown above, combine a simplified pendant with readily accessible levers. Whichever type of control you want—pendant, lever, tape, tracer or any of these in combination—Lucas has it.

LUCAS
OF CLEVELAND



90 STANDARD SIZES

in a Custom-Quality Press

Take your choice of dependable Danly SC crankshaft presses in capacities from 50 to 300 tons...bed areas to 72" x 60"...with strokes to 16"...constant or variable speeds to 90 SPM...with non-gearred, single or double geared drives...equipped for manual or automatic feed.

Every SC press gives you Danly's patented low-maintenance air-friction

clutch, husky welded-steel frame, and countless other custom-quality features.

For low-cost piece part production...in blanking, drawing, piercing, forming, or progressive die stamping...you'll find your choice of Danly SC Presses ahead of the field and best for you. **WRITE FOR NEW SC CATALOG** and get all the details.



DANLY



DANLY MACHINE SPECIALTIES, INC., 2100 S. LARAMIE AVE., CHICAGO 50, ILLINOIS

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STOP

these men
from
stealing your
profits.....

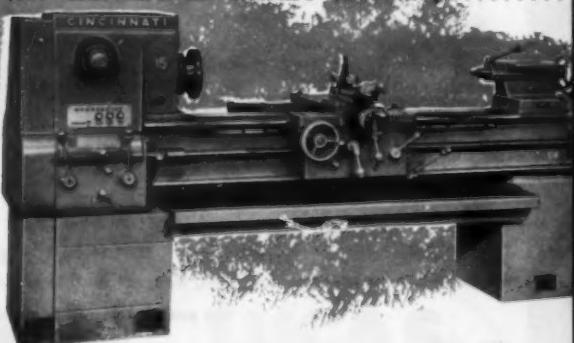


You know about this fellow . . .
he's stealing "cash", and you
do try to stop him.



But YOU cause this theft . . .
you force this man to
steal your profits . . .
make him add to labor and
burden costs on most lathe
jobs, no matter how hard
he works.

The solution is easy:
make your operator a cost-reducer on ALL of his lathe
jobs—shift him to HYDRASHIFT*. Here's why . . .



*HYDRASHIFT is Cincinnati's
new lathe line with the new
way to change spindle speeds
... hydraulically!

Compare the machining of this typical lathe job,

two steps
and two necks

on the new HYDRASHIFT . . . on a conventional lathe



As second step is being cut, operator turns the dial to speed required for the necking cut.



Operator waits for machine to complete the step cuts.



Step cuts completed, operator changes to necking tool (he had it lying on the convenient Tray-Top) and positions tool for cut.



Step cuts completed, operator changes to necking tool and positions tool for cut.



Operator engages spindle lever and cuts the neck—without leaving apron.



Operator goes to head-stock, shifts various levers to change to spindle speed for necking cut.



Necking cuts completed, operator changes tools for next workpiece.



Operator returns to apron, engages spindle lever, and cuts the neck.

Don't force your lathe operators to steal profits from your pockets—take a look at the new Cincinnati HYDRASHIFT Lathes at your nearby Cincinnati Lathe and Tool Dealer's showroom. If you can't reach him immediately, wire collect!



CINCINNATI LATHE AND TOOL CO. CINCINNATI 9, OHIO

HYDRASHIFT Lathes/CINCINNATI Drilling Machines/SPIROPOINT Drill Sharpeners

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HOUR OF DECISION

After hours? — sure You're not surprised at that because you know it's when he (and probably you, too) concentrates on the problems which are vital to his company's continued successful growth. The day is filled with production crises, maintenance problems, personnel questions, and committee meetings. It's only now that he can really study the facts and decide what's best.

Right now he's reviewing his machine tool inventory. He's amazed at how old some of his equipment is getting to be. It seems only yesterday that he signed the purchase order for it to increase his capacity for World War II. But that was 1943, seventeen years ago! No wonder maintenance is getting high and efficiency is dropping off.

We've got a suggestion for this man (and for you, too). Attend THE MACHINE TOOL EXPOSITION — 1960 and see for yourself why Modern Machine Tools = Production Efficiency. This exhibit, the first since 1955, is sponsored by The National Machine Tool Builders' Association* and will contain eleven acres of the U.S.A.'s newest machine tools under power, cutting and forming metal to demonstrate 1001 ways to lower production costs. Can you afford to stay home?

You're also invited to the PRODUCTION ENGINEERING SHOW on the Navy Pier.
No extra registration needed.

*The N.M.T.B.A. represents 90% of the U.S.A. machine tool industry.

FORMULA FOR TOMORROW

THE MACHINE TOOL EXPOSITION - 1960

For information write to

NATIONAL MACHINE TOOL BUILDERS ASSOCIATION

2139 Wisconsin Avenue, N.W. • Washington, D.C.

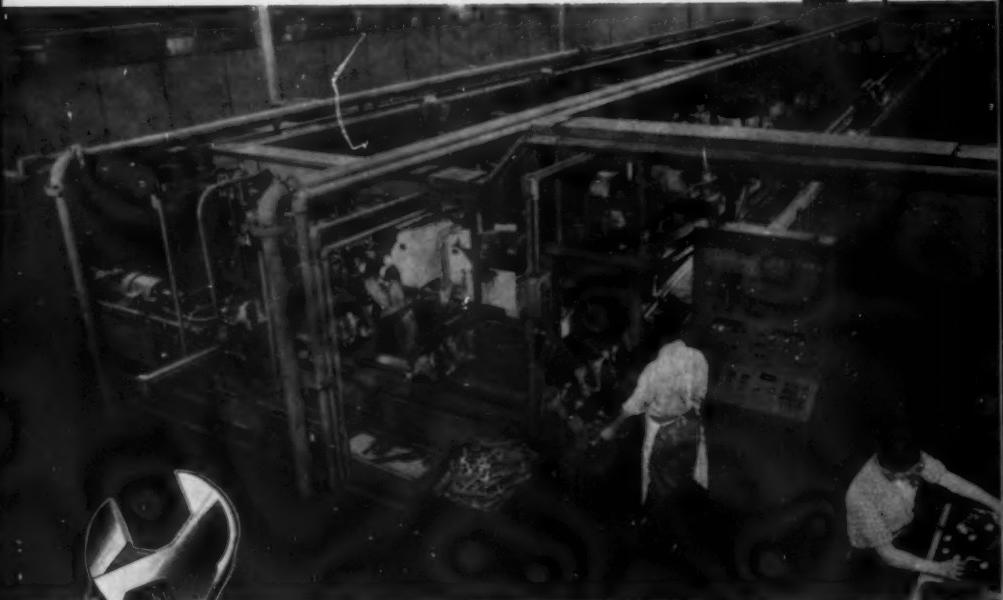
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International
Amphitheatre
Chicago, Illinois
Sept. 6-16

It's a Push-Button World at WILLIAMS

that's why **SUPERJUSTABLES®**
WORK BETTER • LAST LONGER



• **AUTOMATED MACHINING** guarantees smooth adjustment, exact fit in every wrench. This million dollar transfer machine was designed especially for Williams' Superjustable® wrench production. A push of a button puts 28 stations in operation...consistently machining to uniformly close tolerances. Fully machined wrench heads are constantly checked on special gauges to further insure perfect fit with sliding jaws, worms, pins and springs. No other manufacturer has this automated equipment to so precisely machine wrenches that *work better...last longer.*



Send for New Catalog No. 304. Lists over 4530 Stock Wrenches, Tools and Forgings...the Broadest Line of its kind.

J. H. WILLIAMS & CO.
DIVISION OF UNITED-GREENFIELD CORPORATION
418 VULCAN STREET • BUFFALO 7, NEW YORK

Superjustables® are available in regular or locking styles in sizes ranging from 4 to 24 inches, Black or Chrome finish.

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FOR
A REAL GRIP
USE
UNIVERSAL
COLLET
CHUCKS



A sure, solid grip on tools is provided by the wrap-around action of Universal chucks because the slotted collet grips the tool on a continuous surface the full length of the collet. Tools can't slip and tool shanks

don't get scored. Even tool stubs and broken drills can be used successfully. Sizes range from $\frac{1}{16}$ " to $1\frac{1}{2}$ ", with shanks to fit dry machine. Simplified design results in low chuck cost to you. Write today for new "complete line" catalog.



199

UNIVERSAL ENGINEERING CO. FRANKENMUTH 10 MICHIGAN

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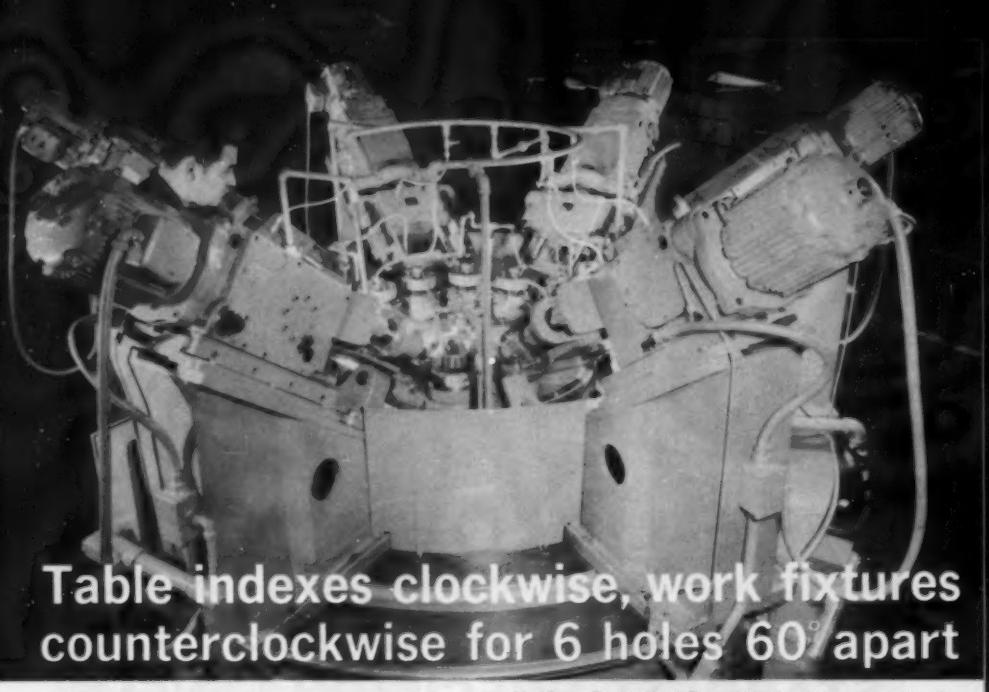


Table indexes clockwise, work fixtures counterclockwise for 6 holes 60° apart

**Kingsbury machine drills
and counterbores
135 steel forgings per hour gross**

Problem: C'bore and drill six angular holes 60° apart in a forged steel gear.

Solution: Six drilling units with two-spindle heads are mounted on angular columns 60° apart on a circular base. An index table holds 12 work fixtures that do not turn with reference to any fixed point. As the table indexes clockwise 30°, each fixture indexes 30° counterclockwise. The work remains clamped as it indexes.

Each unit operates two tools downhill at a 27° angle. The first tool counterbores .1562 diam. at one station for an accurate start. The second drills .0937 diam. through at the next station. The operator changes parts in his fixture while the units perform their automatic cycles. Two tools operate at the same time on the part at the rear station.

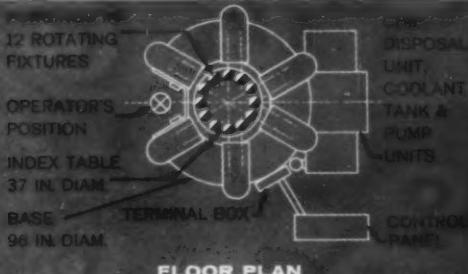
Uniform Parts that Gage Maybe this seems simple. But it takes some doing to . . .

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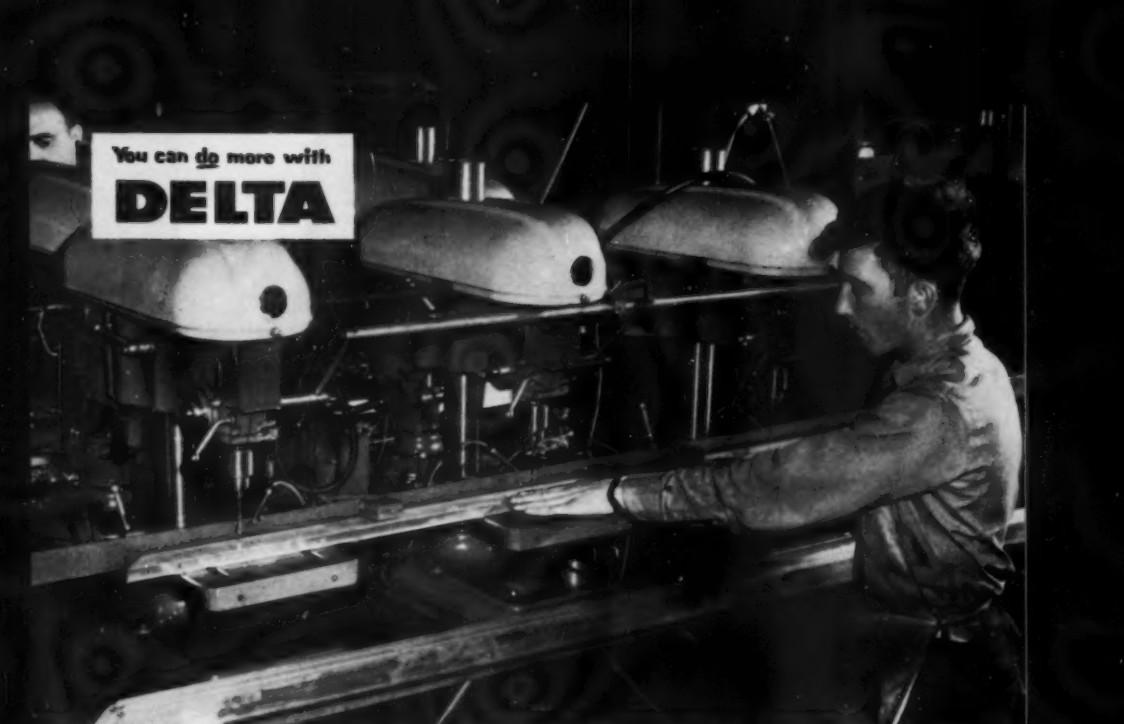
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Delta 15" Drill Press, also
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floor, bench, and multiple
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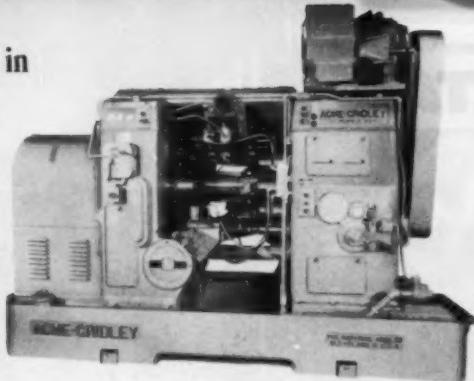
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Major breakthrough in
shaft production . . .



Acme-Gridley multiple-spindle shaft machine equals output of four automated lathes

At Chrysler Corporation's Trenton, Michigan, Engine Plant, a remarkable new National Acme shaft turning machine has slashed camshaft production costs; is hailed as a major production development for the entire industry. Performing complete shaft journal machining in a single set-up, this rugged 6-spindle automatic provides substantial savings in floor space and capital outlay, reduces scrap loss and enables closer control of machining operations. Key to this dramatic pay-off are imaginative National Acme solutions to the difficult problems of centering, driving, and stabilizing the long, flexible shaft during turning operations. An ingenious part-holding technique exposes bearing journals for turning—an impossibility in a chucking set-up.

Extreme capability is stressed in the design of the Universal Multiple-Spindle Shaft Turning Machine and permits the maximum number of machining operations to be performed on straight or flanged shafts held between centers.

The shaft turning machine is additional evidence of National Acme know-how applied to the solution of special machining problems. This same insight and ability is available to any manufacturer interested in reduced costs and increased production. Our representative is as close as your telephone.

National Acme's "Zone of Responsibility" includes all phases of cost reduction. Check YOURS . . . Then Check National Acme

Direct Costs: these include direct dollar savings as realized by Chrysler Corporation . . . an "everyday" job for Acme-Gridleys. **Indirect Costs:** effecting important savings in maintenance, downtime, scrap reduction, tool costs, etc. **Product Redesign:** teaming with your design group to take full advantage of Acme-Gridleys' cost reducing capabilities. **Direct Material Costs:** our engineers provide important savings in this area by constantly matching machines and tools to modern metallurgical problems. **Make-or-Buy Reviews:** in many cases our Contract Division can assume your production headaches and relieve you of immediate capital investment. **Spot Modernization:** pioneering in modern tooling methods, and the flexibility of Acme-Gridleys can provide many "on-the-spot" savings.



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1st position—load and unload.



2. Form Turn 1.951 Dia.
Form Turn 1.967 Dia.



3. Form Turn 1.982 Dia.
Form Turn 1.998 Dia.
Support on 1.967 Dia.



4. Chamfer O.D. of 1.951 Dia.
Chamfer O.D. of 1.967 Dia.
Face Sides of 0.743 Dia.
Support on 1.967 Dia.



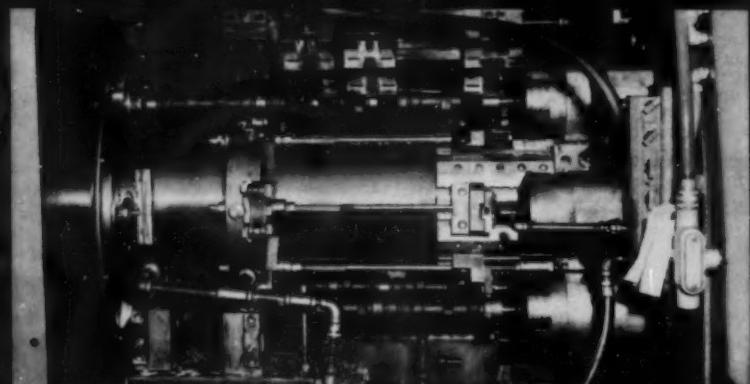
5. Face End of Camshaft
Relieve Turn 1.743 Gear Dia.
Support on 1.967 Dia.



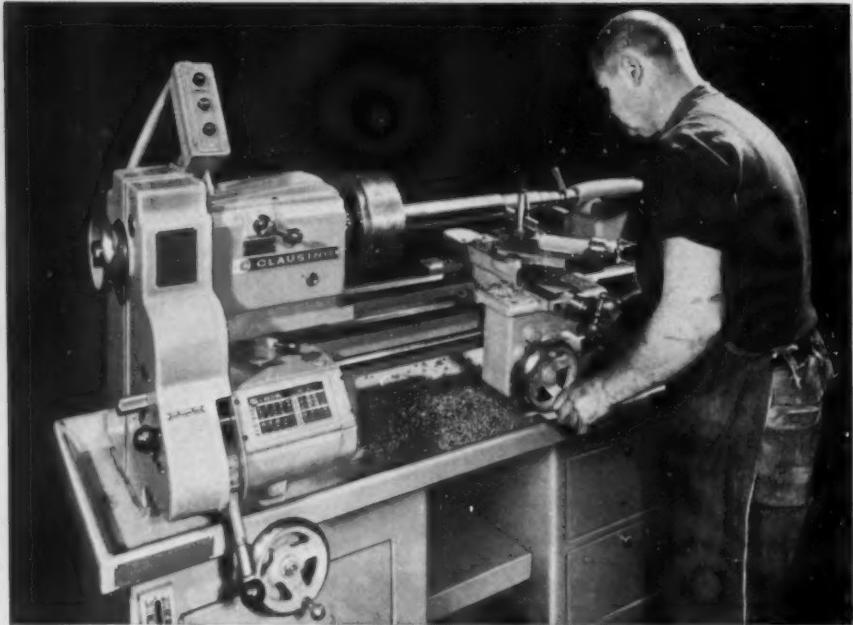
6. Chamfer O.D. of 1.743 Dia.
Chamfer O.D. of 1.982 Dia.
Chamfer O.D. of 1.998 Dia.
Support on 1.967 Dia.



High-test cast iron camshaft with journal machining completed
13 operations in 22 seconds.



Close-up of tooling zone
Open spindle in load and
unload position shows
unique centering, holding
and driving mechanism.



Now... crown-shaved gears standard equipment on Clausing 12³/₄" lathes!

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- (5) Choice of heavy-duty variable speed or 10-speed countershaft, with clutch and brake optional.

(6) Verified precision—factory test report accompanies each lathe.

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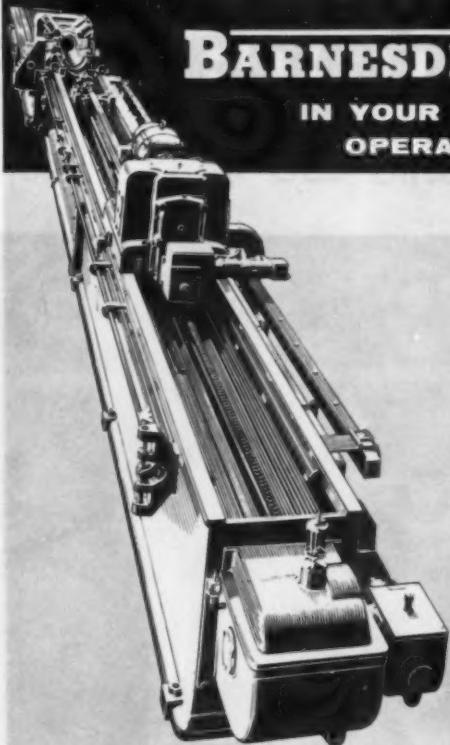
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MACHINE and TOOL BLUE BOOK

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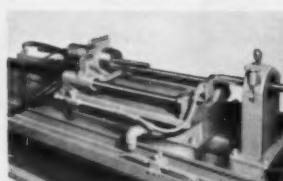
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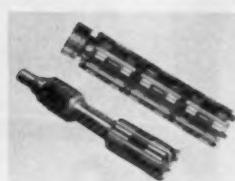
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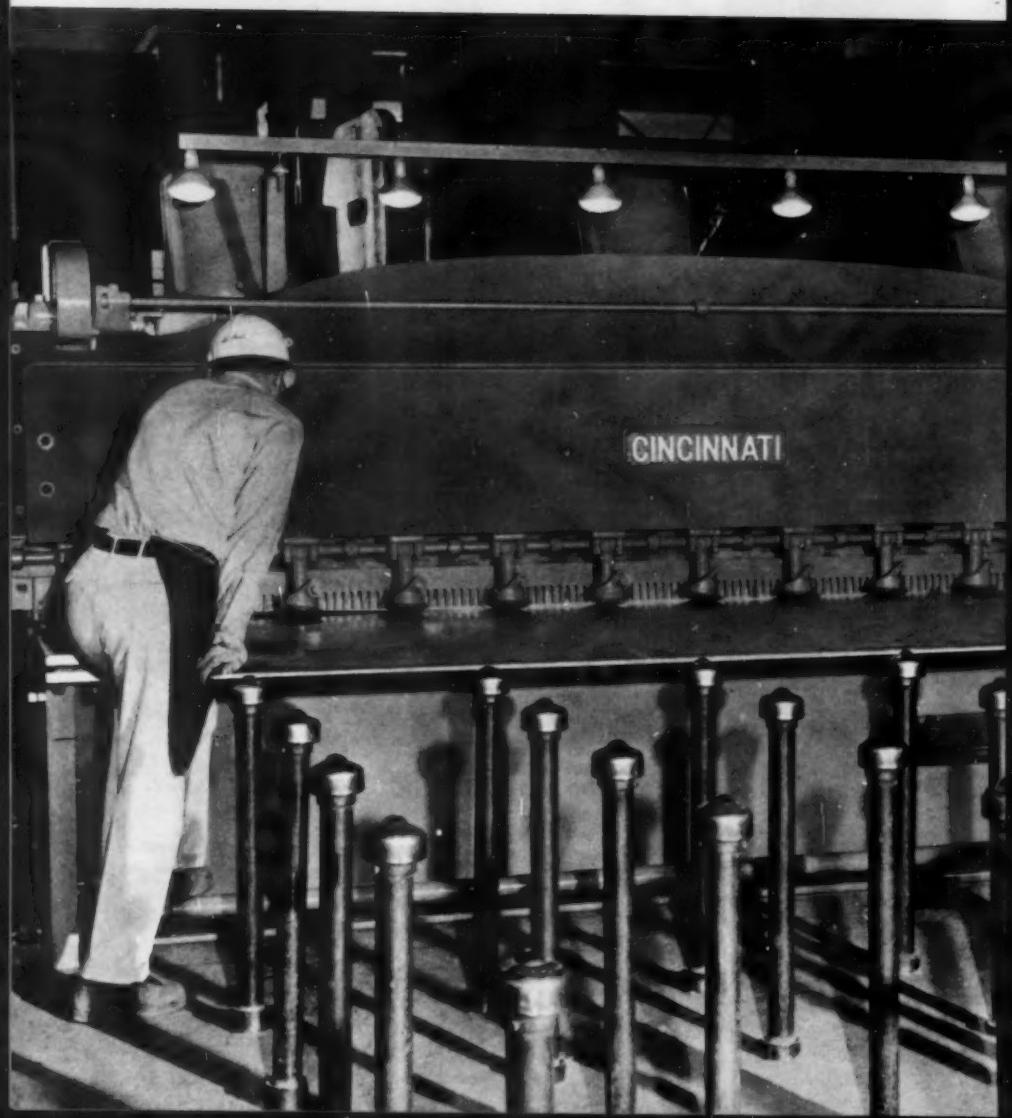
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See our insert in Sweet's Machine Tool file.

Courtesy Bannock Steel Company

Shapers / Shears / Press Brakes

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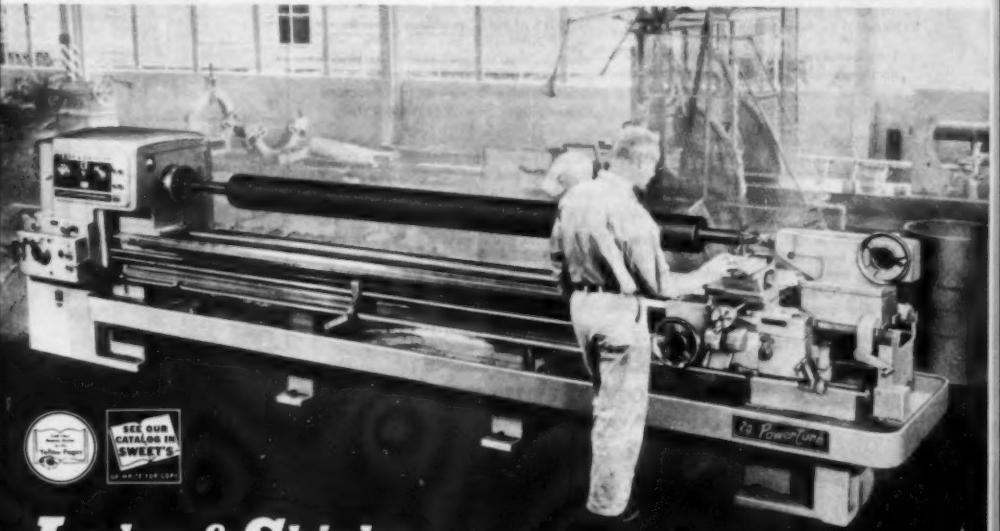
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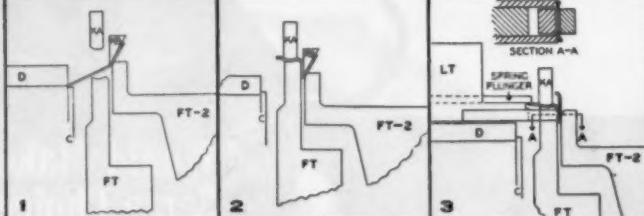


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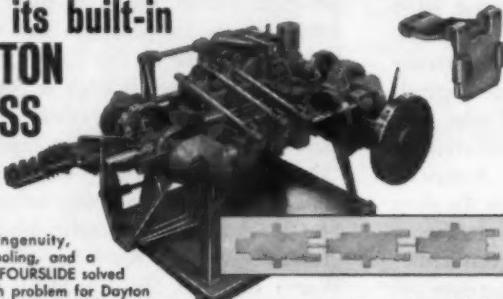
KEY

- KA King Post Tool
- KB King Post Tool Inserted
- FT Front Slide Tool
- FT2 Front Slide Tool #2
- RT Right Slide Tool
- LT Left Slide Tool
- BT Back Slide Tool
- C Cut-Off
- D Cut-Off Die



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on a NILSON S-3-F FOURLIDE
with its built-in
20 TON PRESS



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Write today for the NILSON FOURLIDE Catalog No. 62.



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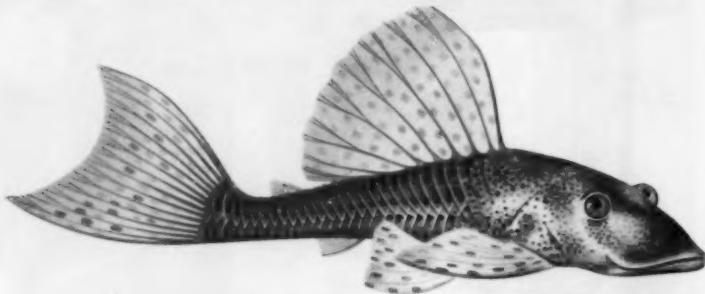


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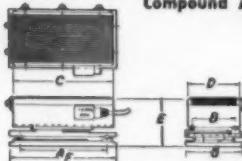
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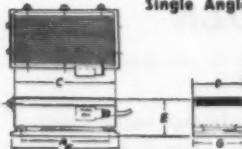


Compound Angle Sine Chuck



MODEL	(SINE) A	(SINE) B	C	D	E	F	G	PRICE
ELECTRO-MAGNETIC								
DA-5	3,000	5,000	6½	6	5½	7½	6½	\$ 445.00
DA-10	10,000	5,000	11½	6	5½	12½	6½	590.00
DA-1010	10,000	10,000	11½	10	5½	12½	10½	1,180.00
DA-20	20,000	3,000	21½	6	5½	22½	6½	1,400.00
PERMANENT MAGNET								
DP-5	5,000	5,000	6	6	5½	7½	6½	445.00
DP-10	10,000	5,000	12	6	5½	12½	6½	590.00

Single Angle Sine Chuck



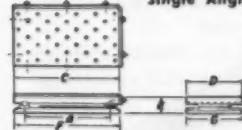
MODEL	(SINE) A	C	D	E	F	G	PRICE
ELECTRO-MAGNETIC							
SA-5	5,000	6½	6	4½	7½	6½	\$ 310.00
SA-10	10,000	11½	6	4½	12½	6½	390.00
SA-1010	10,000	11½	10	4½	12½	10½	775.00
SA-20	20,000	21½	6	4½	22½	6½	950.00
PERMANENT MAGNET							
SP-5	5,000	6	6	3½	7½	6½	310.00
SP-10	10,000	12	6	3½	12½	6½	390.00

Compound Angle Sine Plate



MODEL	(SINE) A	(SINE) B	C	D	E	F	G	PRICE
DA-5P	5,000	5,000	6½	6½	3½	7½	6½	\$ 430.00
DA-10P	10,000	5,000	11½	6½	3½	12½	6½	565.00
DA-1010P	10,000	10,000	11½	11	3½	12½	11	1,050.00
DA-20P	20,000	5,000	21½	6½	3½	22½	10½	1,350.00

Single Angle Sine Plate



MODEL	(SINE) A	C	D	E	F	G	PRICE
SA-5P	5,000	6½	6½	2½	7½	6½	\$ 328.00
SA-10P	10,000	11½	6½	2½	7½	6½	380.00
SA-1010P	10,000	11½	11	2½	12½	11	750.00
SA-20P	20,000	21½	6½	2½	22½	6½	920.00

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the extra value you get with



You want the most efficient set-up for every job—now and when your production requirements change. That's where Walker-Turner "Light-Heavyweight" 20" drill presses can really pay off. These fast, rugged, accurate tools cost far less than many single-purpose machines—yet can do the same work when used as components in standard or semi-automated set-ups. They can be adapted, quickly and economically, to handle *hundreds* of applications. Built to withstand years of heavy duty wear, W-T drill presses offer lower maintenance costs, save you money in reduced operating expenses.

Your Walker-Turner Distributor (listed under "TOOLS" or "MACHINE TOOLS" in the Yellow Pages) is thoroughly familiar with all phases of metalworking. He'll gladly show you the full line of Walker-Turner 20", 17", 15" and new 14" Hi-Speed drill presses—in floor, bench and single or multiple-spindle models. See him soon for money-saving ideas and tools.

For FREE CATALOG of the complete line of W-T metalworking tools, write: Rockwell Manufacturing Co., Walker-Turner Division, Dept. WF-23, 400 N. Lexington Ave., Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Co. of Canada, Ltd., Guelph, Ont.



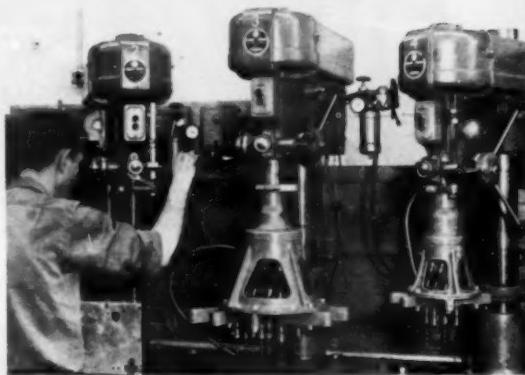
WALKER-TURNER
LIGHT-HEAVYWEIGHT MACHINE TOOLS

another fine product by

ROCKWELL



2 Spindles—drilling and tapping



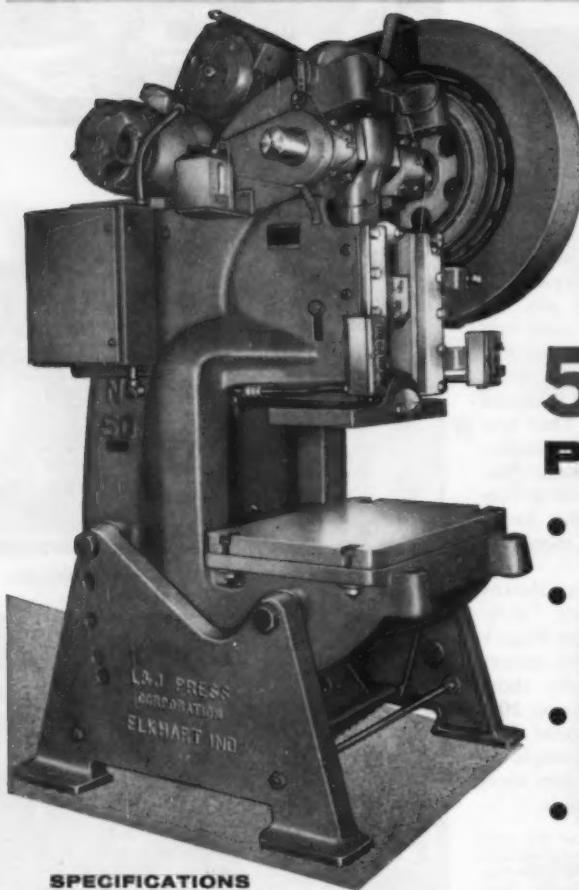
3 Spindles—multiple hole drilling (2 speeds)



24 Spindles—sequence operations

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KEEP GOOD DIES GOOD



with
L&J

50 SERIES PRESSES

- Readily adaptable to wide variety of work.
- Large box-type slide, mounted in long gibbs, maintains accurate alignment.
- Rigid frame design resists deflection under heavy work loads.
- Dies mate perfectly — wear is minimized. Close product tolerances stay close.
- Proven L&J features insure long dependable service, cut maintenance.

SPECIFICATIONS

Two capacities—50 or 60 tons, geared and non/geared models. Slide face 24" x 12". Bolster 36" x 24". Opening through back 22". Shut height 11**. Slide stroke 4**. Slide adjustment 3". *or to suit

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L&J PRESS CORPORATION
1625 STERLING AVE., ELKHART, IND.

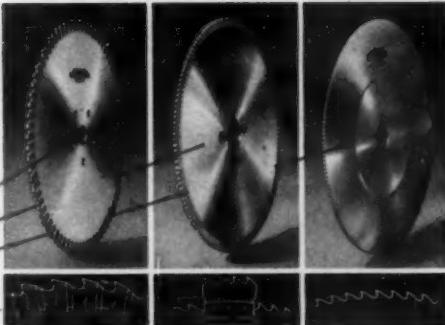
Do you cut ferrous metals? If so, Simonds has three basic saw designs for you:

INSERTED TOOTH METAL SAWS

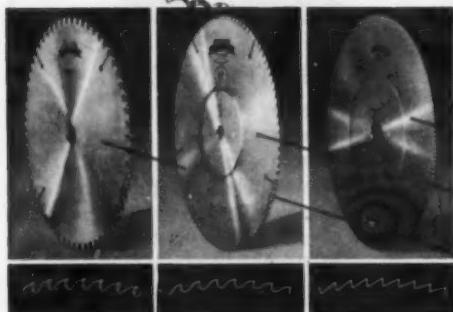
SEGMENTAL SAWS

SOLID TYPE SAWS

Available in High Speed and Semi-High Speed Steels



**There's a
SIMONDS Circular Saw
Exactly Right for Your
Metal Cutting Job**



If you're cutting non-ferrous metals, Simonds offers you:

SOLID STEEL SAWS

Available in "Si-Maloy", in High-Speed Steel for cutting where extreme abrasiveness is present, and in Semi-High Speed Steel.

HIGH SPEED STEEL, HARD RIM SAWS

Hard cutting edge, soft center gives you long life coupled with safety.

CARBIDE TIPPED SAWS
for cutting aluminum and magnesium, as well as other non-ferrous metals

Your nearby SIMONDS DISTRIBUTOR is your direct source for cutting tool and equipment needs. His stores and warehouses are designed with your convenience and economy in mind. Call him FIRST for all your industrial supply needs!



SIMONDS
SAW AND STEEL CO.

FITCHBURG, MASSACHUSETTS

No matter what kind of metal you're working, there's a quality Simonds blade just right — a blade that means faster, cleaner cuts, longer blade life and maximum performance.

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Factory Branches in Boston, Chicago, Shreveport, La., San Francisco and Portland, Oregon • Canadian Factory in Montreal, Que. • Simonds Divisions: Simonds Steel Mill, Lockport, New York; Heller Tool Co., Newcomerstown, Ohio; Simonds Abrasive Co., Philadelphia, Pa. and Arvida, Que., Canada

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NOW...index tables

FOR MORE
ECONOMICAL
PRODUCTION
ON THESE NEW

HANNIFIN "FD" PRESSES

Heavy-duty open-gap production presses with Hannifin hydraulic index tables . . .

Available in all of these sizes:

2, 3, 4, 5 and 6-ton bench models
6, 8, 10, 12 and 15-ton floor models



WITH THESE FEATURES...

- Dual Safety Hand Lever Controls
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- Adjustable Stroke Control
- Reverse on Pressure or Distance
- Full Automatic Cycling
- Hannifin High Speed Hydraulic Index Tables
- Reciprocating Hydraulic Slide Feeds

USE THEM FOR...

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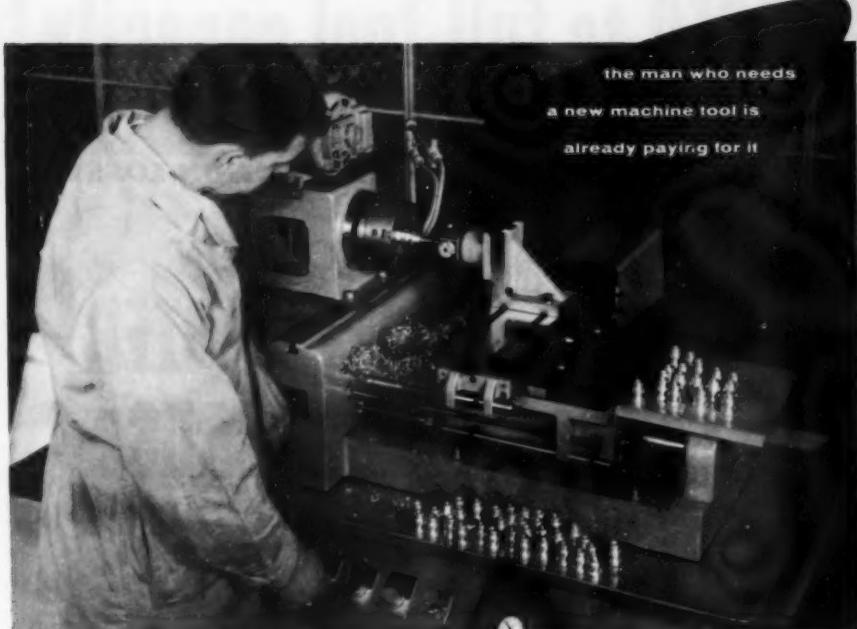
Call in your nearby Hannifin man—he's a trained production analyst—to prove how you can do more at lower cost with Hannifin presses. Or, write for our new Bulletin 132. It tells the whole story.

HANNIFIN COMPANY

529 South Wolf Road • Des Plaines, Illinois

— A DIVISION OF PARKER-HANNIFIN CORPORATION —

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the man who needs
a new machine tool is
already paying for it

"Stingiest" Machine ever made

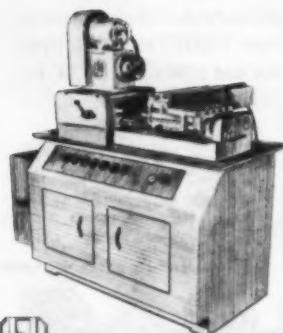
The **J & L Precision Boring Machine** is a mechanical tightwad: "Savings" for the owner are written all over it.

To begin with, its purchase price is far less than you would guess. Then, after it is set up, you find that just about anyone can handle its push button operation. Its simple design doesn't require expensive maintenance either.

This machine's "tightness" extends even to the spindle. It's not only extremely accurate, but also allows adaptation of various types of tooling. It has a threaded nose that will accept all standard air, or manually operated chucks and an inside taper to accommodate 5C collets.

Think that's economical? Well this penny pincher will turn, face and bore at high production rates, yet, because tooling combinations can be shifted quickly, it takes care of the short runs too.

One other thing about the J & L Precision Boring Machine . . . it has a tendency to push its owners into a higher income bracket. If this prospect leaves you undaunted, write for further information.



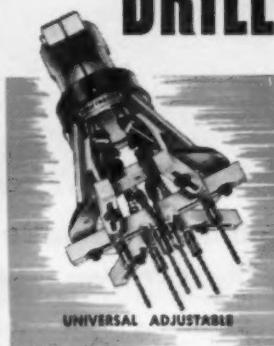
JONES & LAMSON Machine Company • Dept. 710, 520 Clinton St., Springfield, Vt.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

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**...FOR LONG WORKING LIFE
TO ELIMINATE DOWNTIME & PRODUCTION LOSSES!**



THOMSON

THRIFTMASTER DRILLHEADS

Tremendous economies from the use of multiple-spindle drillheads are obvious. Use **THOMSON THRIFTMASTER** Drillheads for optimum performance and profits. *Ask NOW for our new catalog.*

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REAM • BORE
COUNTER-BORE
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FACE



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EXpress 2-2101

Also Makers of DORMAN AUTOMATIC REVERSE TAPPERS



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MACHINE and TOOL BLUE BOOK

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Available in 1-ton and
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If, in 45 days, the Denison Model "A" Multipress does not cut your production costs or does not improve production quality, simplify operations... or give your shop more versatility... simply return the press. You pay only the freight.

GUARANTEED savings in your plant — on any job — assembly, forming, staking... or 101 other press operations. Denison's confidence in the field-proven performance of the Model "A" hydraulic Multipress makes this unique offer possible. Check these important advantages — high speed cycle... easy pressure adjustment... foolproof safety controls... manual or automatic operation... ample 8" daylight for tooling... compact size—only 24" high... smooth, controlled hydraulic pressure does all your pressing jobs better and faster... 1-ton and 2-ton capacity.

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American Brake Shoe Co.
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HYDRAULIC PRESSES
PUMPS • MOTORS • CONTROLS

DENISON

HYDRAULIC MULTIPRESS

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June, 1960

65

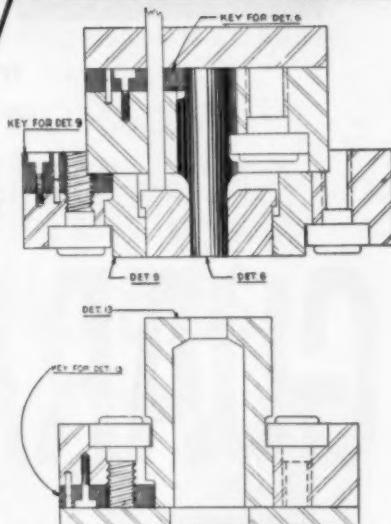
NEW HOVIS KEY-ALIGNED DIE

THE LATEST ADDITION TO OUR STANDARD UNITS

a must
for irregular
stampings

ELIMINATES ALL SET-UP
ERRORS AND INSURES
UNINTERRUPTED ACCURACY

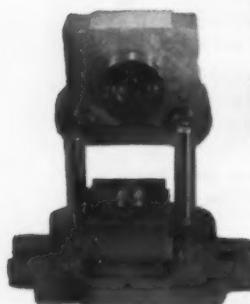
When producing irregular shaped stampings, it is important that the cutting members of the die are located in the proper radial alignment. Hovis has introduced the key-aligned die to meet this requirement . . . With the key-aligned die any press operator can install the inserts without the possibility of misalignment. This is accomplished with a flat on the insert which locates against a key in the retainer.



A section line drawing showing the principle of the Hovis key-align method.



An example of some irregular pieces these dies produce by merely purchasing special sets of parts on which we are glad to quote



Made in 6 sizes:
 $\frac{3}{4}$ " - $1\frac{1}{2}$ " - $2\frac{1}{2}$ " - $4"$ - $6"$ - $8"$

HOVIS UNIVERSAL COMPOUND DIES

for producing WASHERS and SMALL STAMPINGS . . . No need to make a NEW DIE for every STAMPED PART

By simply removing and replacing five, small, interchangeable inserts a new part may be produced . . . This method makes possible all production including irregularly shaped pieces and shallow draws.

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8102 E. NINE MILE ROAD • BOX 97 • WARREN, MICHIGAN

Phone: Slocum 7-4800

Suburb of Detroit

Precision Ground **Atrax** SOLID CARBIDE TOOLS AND BURS



Job Applications

New cutting efficiency has been designed and engineered into a new line of Atrax Stub Routers. These are solid carbide standard, off-the-shelf tools available in nine sizes from $1/16''$ to $1/2''$ diameter and $1''$ to $1\frac{1}{2}''$ in length.

Precision ground, the Series 1546 Router has a single, straight flute, straight shank and right hand cut. Tolerances are kept to $\pm .000 - .003$.

SHOP TESTS PROVE SUPERIORITY

Photo A shows the second of two high speed steel routers failing to cut copper clad Fiberglas printed circuit board. Note the burning of tool and material and the jagged hole at left in test work piece.

The new Atrax Router plowed and cut at 20,000 rpm leaving clean slot shown in photo B.

COMPARISON OF TEST TOOLS



Two high speed routers on left were unserviceable after a few seconds. Atrax Solid Carbide Router showed no wear and left clean slot with no bur on either side of printed circuit board.

NEW ATRAX STUB ROUTER PLUNGES, SLOTS,

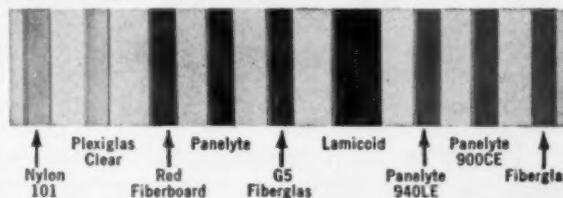
FORMS EXTREMELY HARD-TO-CUT MATERIALS



ADDITIONAL TESTS ON OTHER TOUGH MATERIALS

Nine other materials commonly used in printed circuit board work were tested. All were cut quickly and efficiently with the new Atrax Router.

These materials can also be drilled readily with the new Atrax Micro-Drills available in wire sizes from #1 to #80.



SOLID CARBIDE TOOLING RESULTS

Many new, extremely tough materials can be worked faster, easier with Atrax Routers, Drills and End Mills. The Atrax Company can furnish information on speeds and feeds for best results.

Send for 148 Page "Standard Reference" on Solid Carbide Tools... THE **ATRAX COMPANY**
240 DAY STREET,
NEWINGTON 11, CONN.



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SYNTRON cost-reducing equipment of proven dependability

handle parts automatically



SYNTRON Vertical Vibratory

PARTS FEEDERS

... feed parts of almost any size, shape and material in oriented position to automatic marking machines, assembly units, hobbers, inspection machines and many other automatic operations.

Simplicity of design provides automatic operation with dependability, high rate of parts flow, instant finger-tip control and low maintenance.

Increase your parts handling with efficient, dependable SYNTRON Parts feeders.



Write for complete catalog section

SYNTRON COMPANY

300 Lexington Ave.

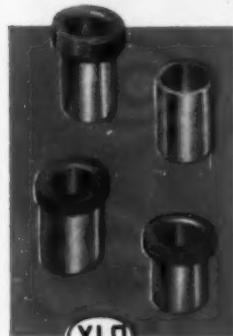
Homer City, Penna.

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Up to twice as much production per .001" of wear!

TEST REPORT SHOWS THERE IS A DIFFERENCE IN BUSHINGS



XLO

Ex-Cell-O
For Precision

Ex-Cell-O Bushings out-perform competition.

An automotive manufacturer put Ex-Cell-O Bushings up against two other leading brands in a practical on-the-job test. Result: Ex-Cell-O out-produced brand A by 1210 pieces, brand B by 345 pieces! Average number of parts pro-

duced during .001" wear:

Brand A...1,045 pieces

Brand B...1,910 pieces

Ex-Cell-O...2,255 pieces

Try Ex-Cell-O Bushings and see for yourself.

Catalog available on request.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

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BRAND NEW!

SANFORD MG GRINDER
and DUST COLLECTOR
in a SINGLE COMPACT
UNIT

MG GRINDER ALSO AVAILABLE FOR
DRY OR WET GRINDING
WITHOUT DUST COLLECTOR

The most widely used precision machine for unit grinding. Famous for its unsurpassed workmanship, quality and vibration-less operation. The MG is the grinder that's been "copied" but never equaled.

PARTIAL SPECIFICATIONS

GRINDER: CAPACITY — 8" x 12" x 12". TABLE TRAVEL — 13", TRAVERSE 8½". VERTICAL CLEARANCE — 12" under 7" wheel. STANDARD GRINDING WHEEL — 7" x ½" x 1¼" hole. SPINDLE SPEED — 3000 RPM. MOTOR — ½ HP. single or 3 phase. TEBB dynamically balanced.

FLOOR SPACE — 45" x 38". 62" high on floor stand. NET WEIGHT — 600 lbs.

DUST COLLECTOR: BUILT INTO GRINDER FLOOR STAND. EXHAUST CAPACITY — 650 CFM. MOTOR — ½ HP. 3450 RPM, single or 3 phase. NET WEIGHT — 140 lbs.



A
COMPLETE
DUST COLLECTOR
INCORPORATED INTO
GRINDER STAND.

- Exclusive design exhaust hood catches all sparks.
- Can be wired to grinder starter.
- Uses standard size filters—renewable or disposable type, or a combination of both.
- No outside exhaust needed.
- Saves floor space.
- Full size rear door gives access for cleanout.

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1026 Commerce Ave., Union, N. J.

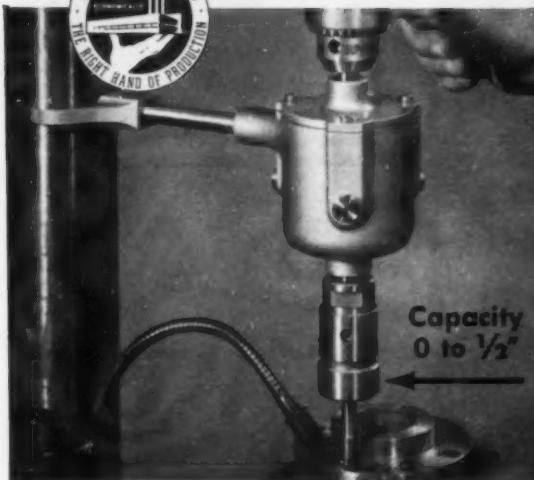
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New!

FOR THE FIRST TIME ...

**O-1/2" CAPACITY
TAPPING HEAD**

FOR JUST **\$63**



**Check
VersaTAPPER
Features:—**

- Capacity 0-1/2"
- Comes complete with tap chuck
- Ball bearing spindle
- Runs in oil
- Fits any drill press
- Fully guaranteed
- Installs in seconds

Supreme VersaTAPPER

DRILL PRESS TAPPING ATTACHMENT

The new Supreme VersaTAPPER gives tremendous tapping versatility — at a price that is no higher than some hand tapping devices. VersaTAPPER's capacity range is from 0 to 1/2". VersaTAPPER fits any drill press. It can be installed or removed in seconds. Why not circle

number on reply card and get full information on the VersaTAPPER. Available in two models:—No. 6100, with straight shank for chucking; No. 6200 with No. 2 Morse Taper Arbor for direct installation to drill press spindle. Each model—\$63.00.

From the makers of **SUPREME BRAND CHUCKS**

SUPREME PRODUCTS CORPORATION
2222 S. Calumet Avenue, Chicago 16, Illinois
DIV. OF A+S+R PRODUCTS CORPORATION

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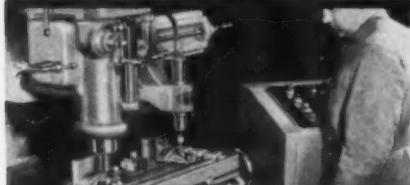
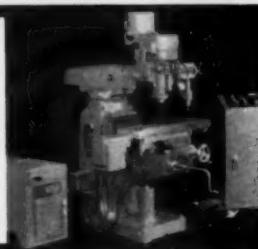
THIS INTRICATE
3-DIMENSIONAL DESIGN
WAS MILLED

AUTOMATICALLY

ON A GORTON



Fully Automatic
AUTO-TRACE DUPLICATOR



NO
MANUAL GUIDANCE
BY OPERATOR
REQUIRED

Numerical Control Benefits at The Low Cost of GORTON Automatic Tracing

This new concept in automation duplicates numerical control results in many instances ... at much lower cost. Complex shapes can be quickly machined, at tolerances and feed rates never before possible. Human error and resultant scrap, are eliminated, and the machine quickly pays back its moderate cost.

The new GORTON 180° Auto-Trace combines instantaneous electronic tracing response with smooth, positive hydraulic feeds. Exclusive features include all-new,

completely integrated, built-in automatic tracing system; dual-purpose deflection meter; increment cross-feed; automatic, co-ordinated feed; area and plateau controls ... plus special attachments that increase versatility and efficiency. If you have a machining problem which calls for numerical control benefits and for completely operator-free automatic production, it will pay you to investigate this new Gorton Auto-Trace electro-hydraulic 180° Duplicator. Write for Bulletin 2968.



MACHINE TOOL EXPOSITION 1968

If interested in completely automatic 360° production profiling on the same type of machine described here, write for Bulletin 2972.



GEORGE GORTON MACHINE CO.

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SINCE 1893 Milling, Die Sinking, Profiling and Engraving Machines with Manual Hydraulic, Electro-Hydraulic or Numerical Guidance Systems
Special Machines and Automated Transfer or Indexing Machines. Cutting Tools and accessories... Defense and special products.

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MACHINE and TOOL BLUE BOOK

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Are
DIAMOND-
GRIP!

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Tension
Controlled
Heat Assures
Uniformity!

3
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Immediate
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of Popular
Sizes!

COLLETS AND FEEDERS FOR ALL AUTOMATICS!

AUTOMATIC BAR MACHINES

STANDARD COLLETS AND FEEDERS;
MASTER COLLETS AND PADS;
MASTER FEEDERS AND PADS;
FULL FLOAT MASTER COLLETS AND
JAWS; COLLET AND FEEDER
TUBES; SPOOLS AND BUSHINGS

TURRET LATHES
STANDARD COLLETS; MASTER
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Sutton Tool Co.

Dept. MTB6, Sturgis, Michigan



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Standard collet for
ACME, CLOUD, GENE, NEW,
BRITAIN, GRIDL, LEV, and WERNER
in CHASEY AUTOMATIC BAR
MACHINES.



Style "A" Master
feeder with both
adjustable and
non-adjustable pads.



Standard collet for
BROWN &
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MATICS.



Standard collet for
4 and 6 spindle
GREENLEE AUTO-
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Super (range-type)
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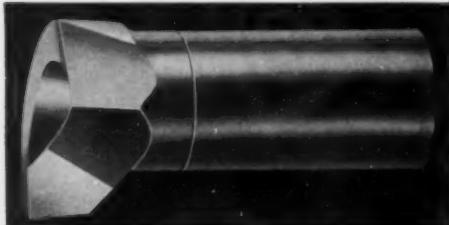
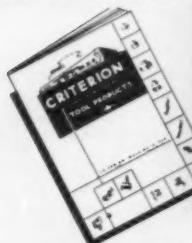
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DAVENPORT
AUTOMATIC BAR
MACHINES.



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See these tools at
your local dealer or
write for literature.



BORING TOOLS

Complete range of sizes.
Boring tools in both High Speed and Carbide
to enter holes from $1/16"$ dia. to $2"$.
Criterion design permits 20% greater tool
life.
Styles include tools for general boring or
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Also available in extra long shank lengths.

THREADING TOOLS

Internal Threading Tools in both High Speed
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True thread form remains for life of tool.
Top face grinding, only, is required to
resharpen.
Available in both standard and extra long
shank lengths.

GROOVING TOOLS

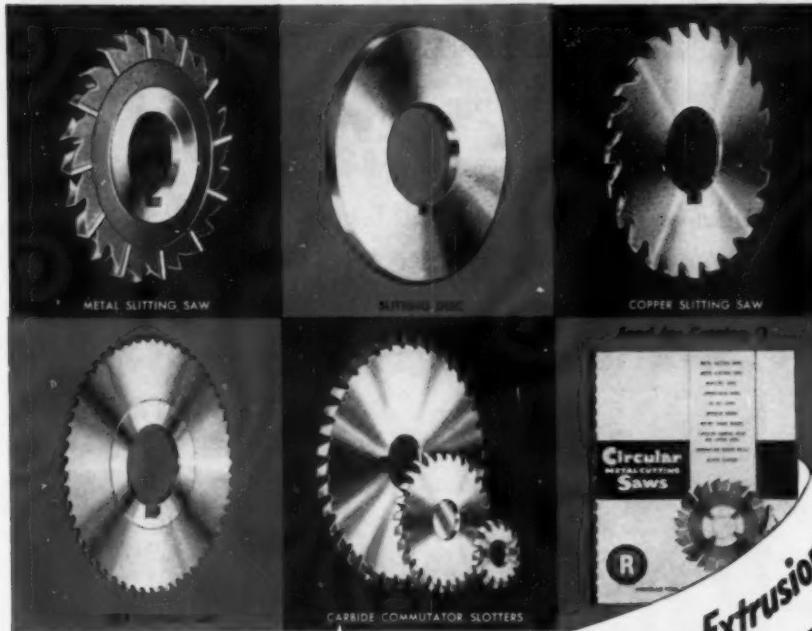
Retaining Ring and "O" Ring Grooving
Tools in High Speed only, available in all
standard sizes.
These are ground to exact specifications as
adopted by the National Aircraft Standards
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and leading industrial concerns.



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June, 1960

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SPELLS THE DIFFERENCE IN BAND SAW MACHINES

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*Quality • Efficiency • Durability • Strength
Utility • Low Maintenance • Reasonable Cost*



- Speeds infinite from 35-12000 FPM covers both cold and hot sawing

- Variable drive 3-speed transmission with precision rolled gears and splines transmits 15 HP

- Hydraulic table feed

See the difference demonstrated in our dealers' showrooms

or

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**BUTT WELDERS
FILING MACHINES
GEAR ROLLING MACHINES**



GRAFTON, WISCONSIN

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In this unique system, a powerful air jet carries a mist of finely atomized fluid direct to the cutting point of the tool and—at the same time—dissipates heat far faster than ordinary flood-cooling methods. Since heat, not wear, is the biggest factor in tool failure, Atom-Lube increases tool life 20 to 30%, improves work quality, and helps accuracy. A non-circulating system, Atom-Lube costs less to buy, install and operate than recirculating systems . . . and is quickly and easily added to machine tools of practically any type. Available in single and double nozzle types; uses any liquid from plain water to heavy oils. Write now for complete information . . . or ask for a demonstration and see for yourself how the Atom-Lube System can help reduce your machining or grinding costs.

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a local businessman, who stocks the tools and equipment you need. You'll **SAVE TIME, CUT BUYING COSTS** and **REDUCE INVENTORIES**.



SAW & BAND SAW BLADES
HACK SAWS • GROUND FLAT STOCK • S300



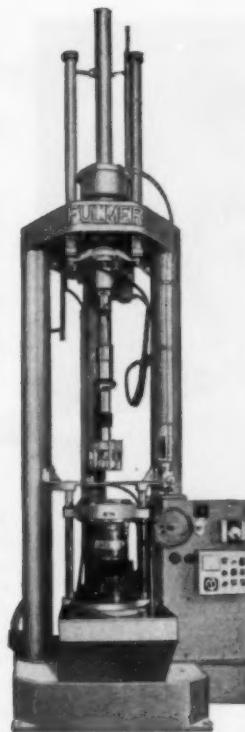
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Case in Point Showing some common alterations of Bunting Standard Stock Cast Bronze Bearing, No. G-119L. Size $1\frac{1}{4}$ " ID x $1\frac{1}{8}$ " OD x 2" long.



1. Cut to 2 pieces
15/16" long.



2. 1/4" hole in center of bearing.



3. Flange bearing
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OD x 2" long.



4. Style #5G
Graphited.



5. Style #4
Oil Groove.

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Now you can afford to equip your
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model

50

- is a brand new nose type handwheel chuck
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- develops more torque
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- costs less . . . less . . . less . . .

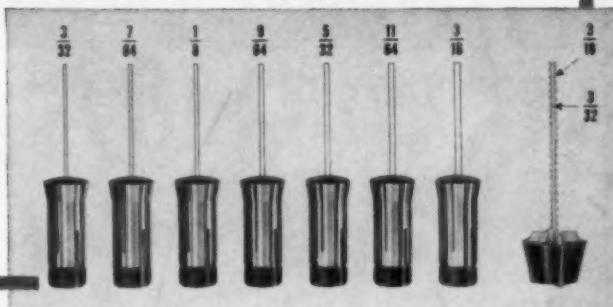
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for the chuck!

\$65⁰⁰

for the collets!
(\$6.50 each)



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for your . . .

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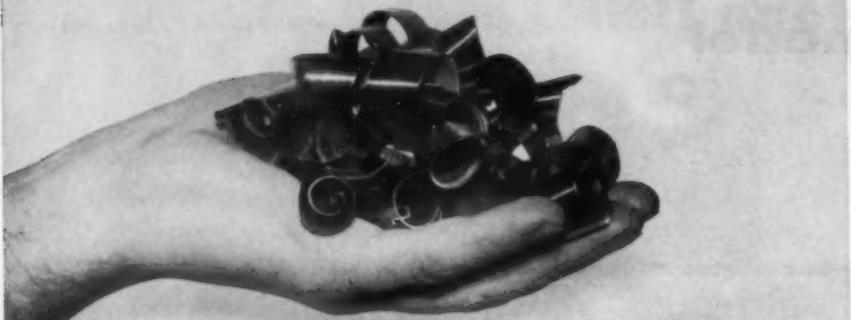
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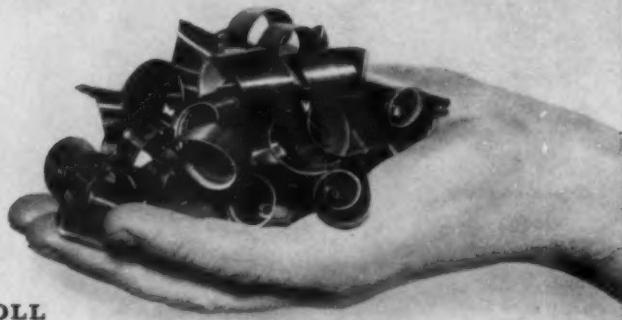
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June, 1960

Why did these chips



cost more than these?



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—because the cutter used to produce the more costly chips was not the right one for the work or for the machine on which it was used. It was a good cutter but not as good as it could have been. It's as simple as that.

The lower cost chips were produced by a cutter recommended by Ingersoll Cutter engineers. Their recommendation was based on an analysis of the

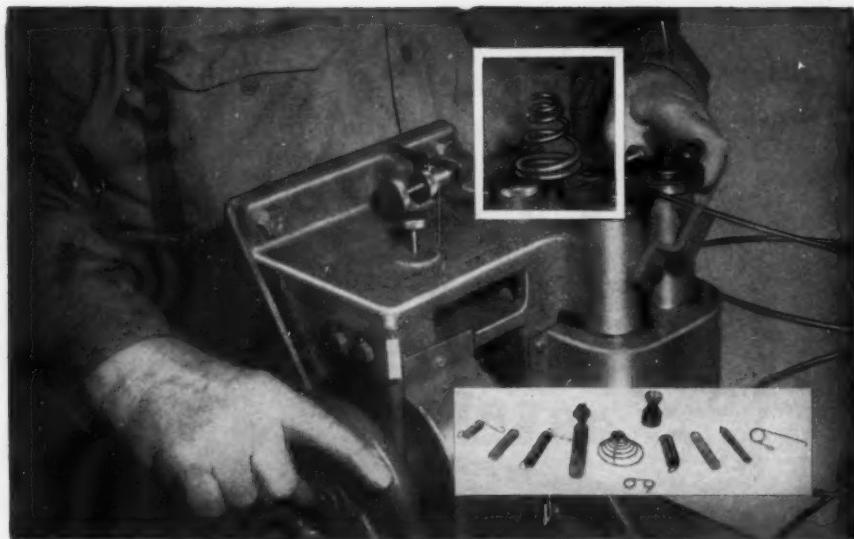
work, the job requirements and the machine.

There are many ways that the cost of chips can be reduced. Why not let an Ingersoll representative make a preliminary survey? It will cost you nothing and may lead to important savings. Ask to have a representative call, or write for booklet "Ways to reduce the cost of chips." Address Dept. E-68.

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For a replacement or experimental spring, any shape, diameter or pitch from flat or round wire sizes .005" to .125", you can produce it in a matter of seconds with Perkins Precision Spring Coiler. You eliminate arbors, yet turn out precision springs — torsion, compression, extension, tapered, or special springs, coiled either left or right hand, in any desired length, any diameter from 3/32" to 12" and larger, with or without initial tension, and with

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Starrett adjustable jaw cut nippers (left) and Gardener Hook-Kon spring looping tool (center) — handy, precision, time-saving accessories for spring coiling. Perkins Spring Coiler available as bench model or power model shown here, (right) for tool shop or continuous runs.



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Please send information and prices on
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Hand Model Power Model

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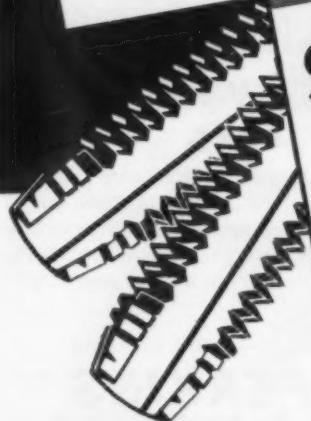
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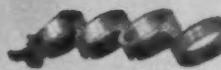
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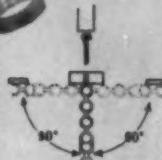
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1 Man out-produces 3 Increases Production 920% with a BURGMASTER Bench Model Turret Drill...



Three end radial holes in this Computer Bridge are drilled and tapped in one setup. The 14 top holes are subsequently drilled on another Burgmaster.



95% of Burgmaster Users Report up to 230% Savings. Write for the complete facts. Free literature illustrates and describes machine features including specifications and accessories.

Six Spindles in $\frac{1}{3}$ Floor Space

Hoffman Electronics, Los Angeles, California, converted production of Computer Bridges from a line of 3 Single Spindle Drills requiring 3 men, to a Burgmaster 6-Spindle Bench Model Turret Drill. Formerly, the 3 men produced 40 parts per hour requiring 3 drill jigs. Now, one man produces 136 parts per hour on the Burgmaster Machine, an increase of 920% on a per man basis.

The operations consist of drilling and tapping 3 radial holes, spaced at 90° around the end. The parts are clamped by air in a 3-position fixture, and between operations are swung 90°, left and right against stops. Cam action by the fixture during turning locates proper offset of each hole. The Burgmaster Turret is "Triple Toolied" to save time for drill #104 and tapping #6-32 in sequence.

The turret action of the Burgmaster Machine lends itself to time saving tooling arrangements. Up to 6 separate tools can be rapidly and accurately presented to the work at one station at the most efficient pre-selected speed and required depth of cut.

For fastest investment return, savings in floor space, faster production and reduced operator fatigue, investigate the many advantages of Burgmaster Drilling Machines for reducing production costs.

Bench Model "O"—\$595.00
FOB Los Angeles — Speed ranges from 350 to 6200 RPM— $\frac{1}{4}$ " Drill and Tap Capacity in Steel— $\frac{1}{3}$ H.P.

Burgmaster Model 1C Six-Spindle Turret Drill — 12 speeds from 325 to 4050— $\frac{1}{2}$ " drill and tap capacity in cast iron—1 H.P.



BURGMMASTER CORPORATION

SMALL TOOL DIVISION - BURG TOOL MANUFACTURING CO., INC.
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WHAT'S YOUR BORE-SIZING PROBLEM?

If it's shown here
—Sunnen Honing
is your answer!

TANDEM BORES

Sunnen Honing Tools size and finish both tandem bores simultaneously... assure perfect alignment and identical size of both holes.



THIN WALL PARTS

...are quickly sized and finished without bore distortion. No fixtures, no chucking — no "spring back!" Accuracy guaranteed to .0001".



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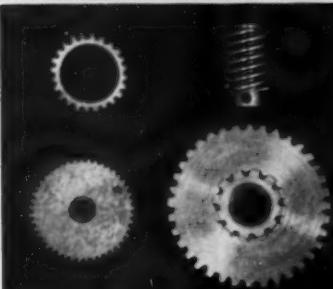
...99 case histories with production rates. Shows versatility, precision, and fast stock removal rate of Sunnen Honing.



AVERAGE COST OF SUNNEN HONING MACHINE WITH TOOLING ONLY \$1,000

Standard tooling range:
.100" through 2.625" dia.
Built to order: through
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B071 A



BORES IN SMALL PARTS

ID's as small as .100" can be quickly sized and precision finished. Sunnen Honing corrects out-of-round, taper, bow, bell-mouth, barrel, and chatter marks.



PORATED BORES

...long, self-locating honing tool bridges ports... eliminates edge washout... guarantees geometric straightness and roundness of the bore.

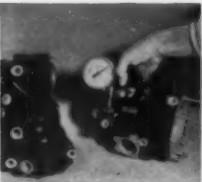
SUNNEN
HONING

MANUFACTURING PRODUCTS COMPANY

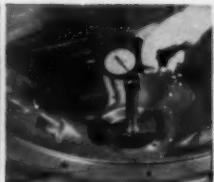
*Here's what they're using to
gage precision bores on...*



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FUEL CONTROL
UNIT



TRACTOR
HOUSING



PUMP
COMPONENT

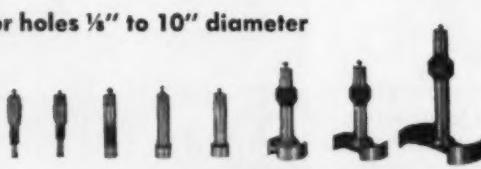
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Comtorplug's unique expansion principle gives automatic 2-point gaging shown as a fixed reading to a fraction of the large clear .0001" graduations. With its true 2-point gaging, you can see the diameter at any point of the bore, detecting front or back taper, ovality, barrel shape, bell mouth, etc. If you have a fast-moving volume-precision program, learn why others have adopted this "tells-all" gage by the thousands. It's not expensive. Write for details.

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For holes $\frac{1}{8}$ " to 10" diameter



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with interchangeable expansion plugs to gage
simple or special holes to a fraction of .0001".



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SURFACE GRINDER

with

* **Automatic forced lubrication**
goes into operation as soon as machine is started
— triples life of the ways and preserves original
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* **Direct drive spindle**
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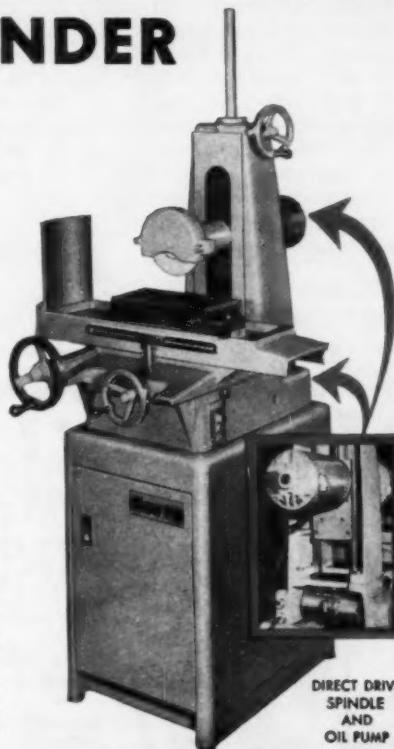
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All Standard Equipment

The new 612 represents a break-thru in design and construction whereby Harig now offers industry a low-cost, precision surface grinder loaded with features usually found only on expensive models. Easy to operate . . . requires little maintenance . . . built with the precision quality you expect from Harig.

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Harig 612 Surface Grinder



DIRECT DRIVE
SPINDLE
AND
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HARIG'S NEW IMPROVED GRIND-ALL FIXTURE

Easily grinds irregular shaped perforators concentric with shank within $\pm .0001$ accuracy. Also can be used as milling, boring and inspection fixture.
NEW ATTACHMENTS: Radius Dresser Arm and Ball Seat Punch Adapter. [Write for new Grind-All Brochure.]

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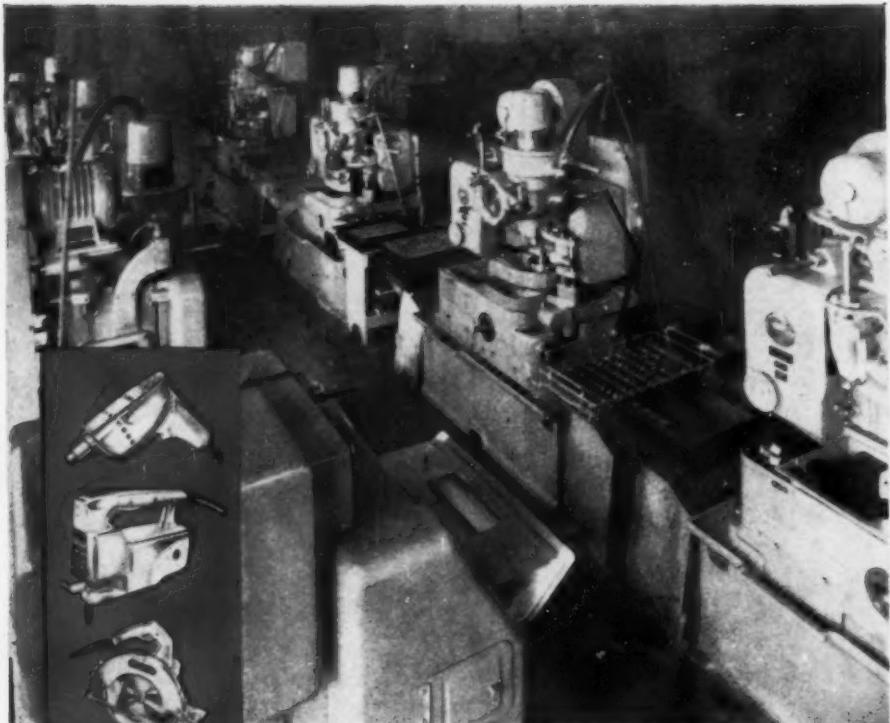
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FELLOWS GEAR PRODUCTION

Builds Extra Quality



View of production floor at Stanley Electric Tools, showing some of the Fellows Gear Production Equipment used.



Gears produced with Fellows Machines add high quality to these Stanley Electric Tools.

THE
PRECISION
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Fellows

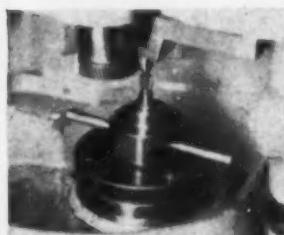
EQUIPMENT at Lower Cost for STANLEY

Stanley is a name you know . . . a name that stands for high quality in electric tools.

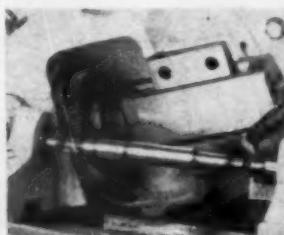
To insure this quality, while providing the high production rates that mean lower costs, Stanley Electric Tools, Division of The Stanley Works at New Britain, Conn., uses Fellows Gear Production Equipment for shaping, shaving and inspecting the armature pinions for its electric tools.

Fellows has long been the leader in Gear Production Equipment, with machines for every gear production job: Fellows Gear Shapers, Pfauter Gear Hobbers, Fellows-Reishauer Gear Grinding Machines, Fellows Gear Shaving Machines and Fellows Inspection Instruments.

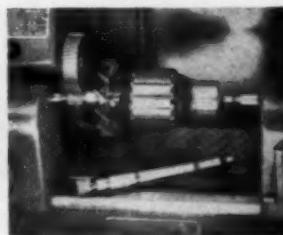
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SHAPING. The versatile No. 7125 Fellows Gear Shaper gives Stanley high production speeds (up to 450 strokes per minute). It also provides fast, simple changeover from one job to another.



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June, 1960

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BOOK REVIEWS

PRACTICAL DESIGN OF SHEET METAL STAMPINGS. By Federico Strasser. Chilton Co., Book Division, Philadelphia 39, Pa. 175 pages. \$10.00

The information of stamping technique which the author has gathered in this book will be valuable to anyone engaged in or interested in the production of articles made of die-produced components. Certain fundamental ideas about mechanical design are presupposed, although a specialized education is not a requisite for the reading and study of this text.

This book shows those factors in design of metal stampings which bring about economical and trouble-free production, and also how this may be achieved by intelligent application of basic rules and concepts of stamping technique.

STARTING AND MANAGING A SMALL CREDIT BUREAU AND COLLECTION SERVICE. By Harold A. Wallace. Small Business Administration, Washington, D.C. 187 pages. \$6.00

This is Volume II of the Starting and Managing Series published by the Small Business Administration. The book has as its target two groups: first, those who are thinking of operating credit bureaus and collection services; second, those who are now active in the field. However, students of business management and any small businessman will read this booklet with profit. While it describes in detail the proper ways of starting and operating a credit bureau, it spells out also the pitfalls confronting the newcomer.

Another Book Review appears on page 209.

COOLANTS FOR METALWORKING

H

HYDRAULIC FLUIDS AND PACKINGS

U

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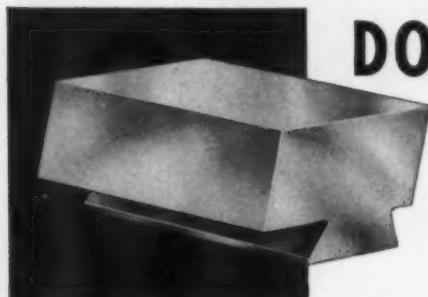
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Pantograph for milling, drilling and engraving.

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features in this issue

YOU WILL FIND THE ANSWER IN CHICAGO THIS SUMMER IF YOU WANT TO REDUCE MANUFACTURING COSTS, says Alan C.

Mattison, President of the National Machine Tool Builders' Association in an interview with William F. Schleicher. Mattison comments on new developments in the machine tool industry, the real issues behind the oft-used word "Productivity", and some interesting thoughts about foreign-made machine tools.

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NOSE CONES—A STUDY IN GRINDING TECHNIQUE, by Darrell Ward,

examines the solutions of problems which confronted Raytheon's Missile Division when they tackled the job of machining aluminum oxide nose cones. Just to confuse matters, the wall thickness of the nose cone is not uniform dimensionally, it being necessary to have a uniform dielectric thickness for the missile's radar.

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WHY DO CUTTING TOOLS FAIL? asks Dennis Jones in his column

on CUTTING TOOLS. The point raised is well taken; for, up to a point, tool wear is directly proportional to temperature. Suddenly things go wrong as the temperature passes a critical point and the wear rate soars.

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WHAT DO YOU BEND ON A BENDER? is concluded in this issue.

Engineering Editor Darrell Ward analyzes the selection of mandrels, important points in setting them up, and also reviews troublesome areas in bending which affect the quality of work.

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WHY SLOW DOWN FOR THE CUT-OFF, when everything else is

running faster? A good question, asked by Horace Frommelt, in view of the increasing use of carbide tooling and high machining speeds. While not the ultimate, the next step could be towards the cut-off tool shank with indexable carbide inserts ..

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BALANCING TOOL LIFE is more than a dream. By using the laws of

friction it is possible to obtain better tool life without reducing the surface feet per minute or by changing the work material specifications.

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AFTER YOU DECIDE TO MAKE A PART, WHICH IS THE BEST WAY TO MAKE IT? Columnist Allan Young shows how charting

cost versus quantity will reveal the need for changing methods. Trouble is, not many engineers follow through by producing complete charts.

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seen and heard in industry

2



By **Bill Schleicher**

Vice President and Editorial Director
Hitchcock Publishing Co.

- ✓ **Union Squabble Mars Tool Show**
- ✓ **Quality Control Gains Stature**
- ✓ **Are Shows Worthwhile?**

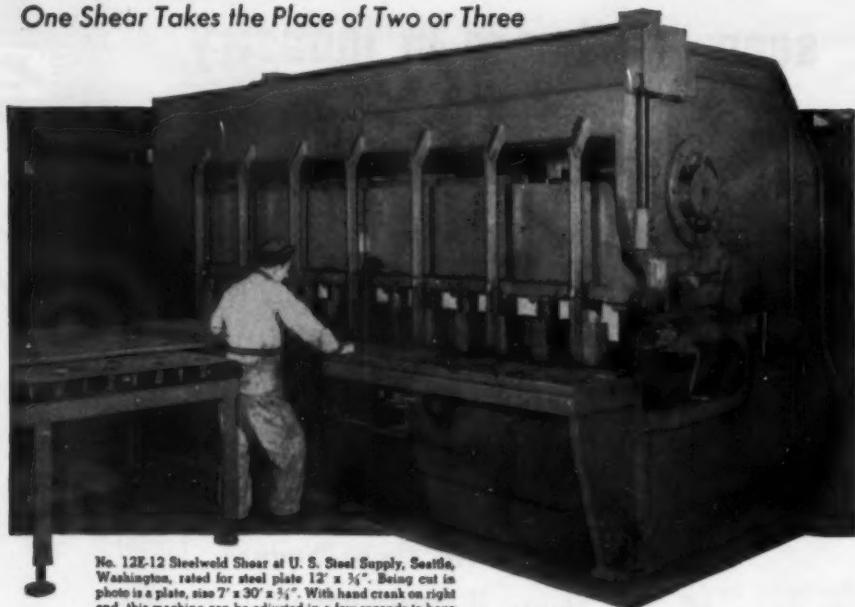
■ Overshadowing the technical exhibits of the recent ASTME Show in Detroit was an unhappy labor situation. Many exhibitors would probably substitute the word "wretched" for "unhappy"; however this may be, one question was uppermost in the minds of the majority of exhibitors: is Detroit the city in which to hold a tool show?

Exhibitors were caught in the middle of a jurisdictional union squabble which resulted in exorbitant labor costs. Instances of exhibitors paying hundreds of dollars through the nose for help were common. In our own booth, a charge of \$40 was demanded for a piece of work which we performed ourselves in 15 minutes. Charges of extortion were heard from many quarters. Either the exhibitor paid up or his equipment was not placed in operation. "We were really held up," one angry exhibitor sizzled, "we had to pay through the nose or they wouldn't touch our stuff."

"This is my last show in Detroit," said another. Talk of exhibitors' refusals to return to Detroit unless the labor situation was resolved was heard from many people. Unless a more honest and hospitable attitude becomes evident, Cobo Hall, now being readied in downtown Detroit, and which is supposed to become

U. S. Steel Supply Provides Customers with SMOOTH ACCURATE SHEARING

One Shear Takes the Place of Two or Three



No. 12E-12 Steelweld Shear at U. S. Steel Supply, Seattle, Washington, rated for steel plate 12' x $\frac{3}{4}$ ". Being cut in photo is a plate, size 7' x 30' x $\frac{3}{4}$ ". With hand crank on right end, this machine can be adjusted in a few seconds to have exactly the right knife clearance to obtain the finest cut for any thickness. To make this adjustment on guillotine-type shears usually requires several hours.

MANY steel warehouses have two and often three shears, one of a $\frac{3}{4}$ " capacity for lighter thicknesses, another of $\frac{1}{2}$ " capacity for cutting $\frac{1}{4}$ " to $\frac{3}{4}$ " material, and a third with 1" capacity for thicknesses over $\frac{3}{4}$ " and up to 1". At some of its warehouses, U. S. Steel Supply uses only one machine for cutting the various thicknesses—a Steelweld Pivoted-Blade Shear.

One machine takes the place of two or three,

because it is so easy to adjust the knife clearance required to obtain the best cuts for different thicknesses, which can range from lightest gauge metal to the heaviest plate within the capacity of the shear.

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the country's finest exhibition hall, may turn into a \$54-million mausoleum. It does not take long for news of the ASTME's experience to chill the ardor of prospective associations who may have planned to hold shows in Detroit.

Significantly, neither Governor Williams of Michigan nor Mayor Miriani of Detroit were at the opening ceremonies, a splendidly hospitable attitude toward exhibitors and visitors who left \$2-million in Detroit during the run of the show.

■ Having covered tool shows for the last 20 years, we met many friends and saw many products which have become stand-bys in our industrial life. Sometimes one does not see too many new items, new in the sense that they embody new concepts or reflect original approaches to old problems. Improvements were visible in almost all of the products, new lines have been added, and on every hand were evidences of industry's demands for finer finishes and closer tolerances.

In the area of quality control, industry has had to provide tools and methods and the development of special gages, automatic size controls, built-in gaging systems and tools for the measuring of small holes and the determining of surface finishes to a millionth of an inch. Several automatic gaging machines, for they are more than mere gages, were in evidence at the show. Again, while they are not new as of last April, they tend to show the direction which gaging has taken. The proper setup on many critical jobs will be a ma-

chine tool from which the parts are automatically ejected into a gaging machine where they will be gaged and sorted and counted. We will, in the future, see much more of this sort of thing. Feedback, correcting the machine when the gaging mechanism tells it that parts are coming through defective, is available, and will be used more in the future.

As we see this sort of thing, we cannot help but agree with the General Motors engineers who maintain that this is merely advanced mechanization and should not be called automation, the latter being a pretty badly overworked word.

Hopper feeds, index tables and tools mounted above, below and around the work were, as in previous years, much in evidence. So much can be done with this sort of tooling that we are constantly surprised, when visiting plants, that more management people don't listen to their production and engineering personnel who want to install this type of equipment which is in the low-cost bracket.

■ From a technical standpoint and from the social aspects, which meant the meeting of many fine people and the renewing of old friendships, the show was a success. However, we did resent having to pay 20¢ for a cup of coffee. The food prices were not exactly realistic, but then, neither are they in Chicago. There is a feeling that an exhibitor and a show visitor are always ripe for a fleecing. One wonders if shows and exhibits are worth all of the bother, cost and headaches.

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By Harry Conn
Chief Engineer
Scully-Jones & Co.
Chicago, Illinois

ENGINEERING and TOOLING



Use Laws of Friction For Balanced Tool Life

■ There is a way to obtain better tool life *without* reducing the surface feet per minute or changing the work material specifications.

Sometimes improvements in tool life and workpiece finish can be made just by applying some of the basic laws of engineering or physics. For example, the 2nd law of friction also applies to metal cutting.

The second or classical law of friction states, "Friction is independent of the apparent or geometrical area of the sliding surface." The first law states that "Friction is proportional to the normal force or load." In other words if an automobile brake band of one inch width is increased to two inches, the amount of friction will be the same. The amount of friction will depend upon the force exerted by the brake band upon the brake drum. The two inch wide brake band will wear twice as long as the one inch wide brake band but will show the *same friction values* for corresponding forces or pressures.

In Figure 1, are two roughing cuts being taken on a conventional lathe. The first cut shows the side cutting

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ENGINEERING and TOOLING continued

Edge Angle called SCEA in cutting tool nomenclature to be 0° . The second cut shows that the SCEA has been changed to a 45° angle. This will present 41% more cutting tool to the work piece to absorb the friction of the cut. The friction will not be altered but, like the increased width of the brake band, it will have a larger area to absorb the friction and wear and will therefore show improved tool life. The per cent of increase in tool life will not be the increase in linear distance of the cutting edge, but it will be a very wholesome and adequate increase.

The SCEA should be increased and, of course, this is usually limited to the piece part, design and sequence of other cutting tools within an operation. Many turning tools used in England use a larger SCEA angle than

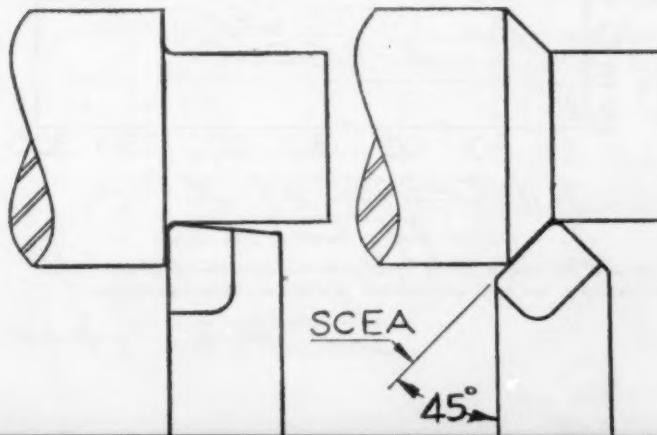
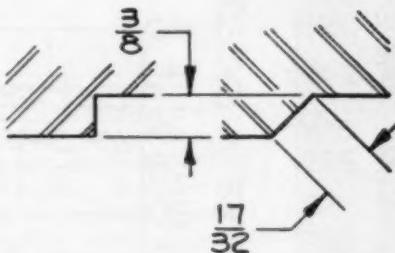
the 45° that seems to be acceptable in this country.

The application of these first two classical laws of friction can be applied to roughing cuts and some finishing cuts to obtain increased tool life. The first law of wear is supposed to be "wear rate is independent of the apparent area of contact." This law does not hold true in cutting tool life tests.

Metal cutting efficiency can often be improved by knowing the effect that speed, feed and depth of cut has upon tool life. Frederick W. Taylor discovered their effects many years ago but manufacturing engineers for the most part have not used his discoveries.

It isn't uncommon to see a part being turned by using two roughing cuts which, if combined, would still

1. Two roughing cuts, one with 0° side cutting edge angle and the other with 45° . This represents a 41% difference in area of the cutting tool to absorb the friction of the cut. Result is increased tool life.



use much less than the total horsepower available.

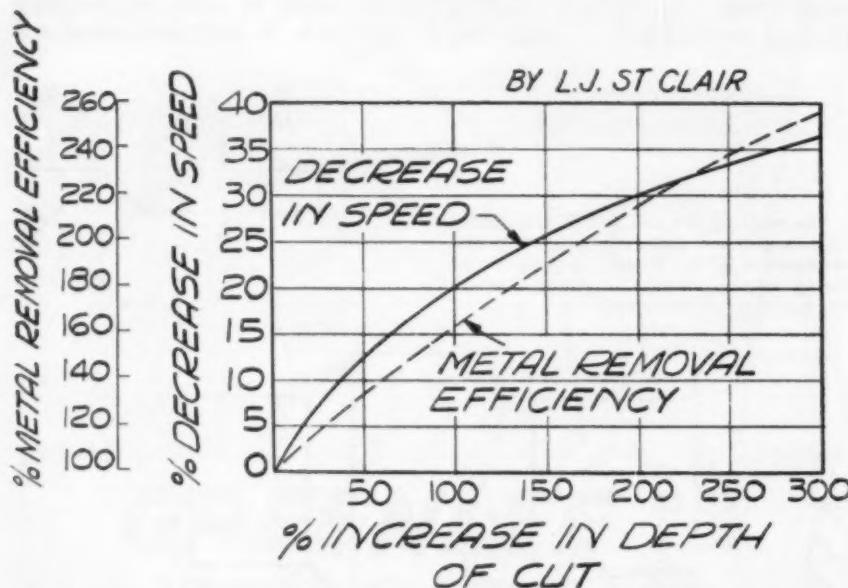
From Figure 2, we see that if a cut is doubled from $\frac{1}{4}$ " to $\frac{1}{2}$ " in depth the speed would only need to be decreased 20% to obtain the same tool life and the efficiency increased 64%. If the depth of cut was increased from .250" to .750" the speed would only have to be decreased 30% to be able to obtain the same tool life as the present speed. At the same time the efficiency of the cutting tool would be increased 120 per cent.

In many special machines the optimum speed is not determined nor affected by the roughing tools. Therefore many cuts could be doubled in depth, speed decreased to obtain

present tool life and one roughing cut eliminated. When the piece part is very rigid or stiff and efficient tool holders are used, the effect of depth of cut upon tool life is often less than that shown in Figure 2. In other words the values shown in Figure 2, are liberal.

By taking the deepest cut and a heavy feed with the most speed possible with existing horsepower capacity the most efficient cut is obtained for roughing cuts.

Minimum cost tool life should be computed by using "Optimization" equations but this article only shows the effect of depth of cut on tool life and SCEA effect upon tool life. • • •



2. By taking the deepest cut and a heavy feed with the most speed possible with existing horsepower capacity, the most efficient cut is obtained for roughing cuts.

By **Paul Prikos**
Prikos & Becker Tool Co.

4

THE PRACTICAL DIEMAKER



An Effective Outline For Teaching Apprentice Die Makers

Part 2

■ Entering the third year of die making, we expect the student to be capable of grasping more difficult projects. One thing of importance is to try to keep the actual shop training correlated with the theoretical instruction. One should not, however, expect the fledgling diemaker to build complete dies. In order to keep the student's interest high, related industrial movies about shop practice should be shown from time to time. The outline for instruction continues as follows:

THIRD YEAR OF APPRENTICESHIP

1. Cam dies
 - a. Principle and various types.
 - b. Theory of movement.
 - c. Typical cam action.
2. Combination of cam action dies with other operations.
 - a. Pierce top holes and side holes.
 - b. Internal cams-indent, emboss and forming.
 - c. Stripping methods.
3. Advance compound dies.
 - a. Sectional construction.

CRAFTSMANSHIP IN ENGINEERING

PRACTICAL DIEMAKER continued

- b. Knockouts, yokes, keying and sinking into punch holder.
4. Shaving and Burnishing dies.
 - a. Theory and allowances.
 - b. Secondary dies and progressive shaving dies.
5. Progressive Die Problems.
 - a. Complete layout of a multi-step progressive die.
6. Introduction to Drill jigs.
 - a. Description and principles.
 - b. Various types: plate; open front; box or hex; leaf; cradle; indexing, etc.
 - c. Commercial parts used—bushing and the like.
7. Introduction to Fixtures.
 - a. Description and principles.
 - b. Various types: milling; grinding; turning; tapping; face plates; and vise jaws.
8. Introduction to Gages.
 - a. Description and principles.
 - b. Various types: plug; indicating; template; ring, etc.
 - c. Gage makes tolerances, X, Y, and Z classes.
9. Assembly tooling.
 - a. Riveting; staking; welding; alignment and other tooling for assembly.
10. Special stamping presses.
 - a. Eyelet machine versus progressive dies.
 - b. Transfer slides and presses.
 - c. Multi-slide and form slide machines for spring clips and similar parts.
11. Press brake dies and their uses.
 - a. Steels used.
 - b. Form, pierce and gang dies.
 - c. Catalogue with illustrated examples of actual applications.

We should bear in mind that any of the topics discussed in the third year training can become highly specialized fields. However, the trainee must be made cognizant that many facets of diemaking exist that he may never encounter during his career. • • •

Next month will be the third and final outline covering the final (4th) year in tool and die making apprenticeship training.

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By Dennis G. Jones
Assistant Chief Engineer
Kennametal Inc.

5

CUTTING TOOLS



WHY DO CUTTING TOOLS FAIL?

■ The cutting of metals by the chipmaking process must be defined as an art, because we do not fully understand why we are successful. Were it entirely understood then it would be completely scientific and we could calculate the results to be expected under any given set of operating conditions.

The great number of variables encountered in metal cutting are most difficult to evaluate and when combined, result in complex relationships that defy description in simple mathematical terms. This is why surface speed recommendations for cutting any metal or alloy are invariably stated as a range; 250 to 350 sfm, for instance. The optimum speed will be dependent on the relationship of the actual variables of the specific operations.

Each year, through metal cutting research, we move a little closer toward scientific solutions of the metal cutting problems. Sometimes our progress does not change the practice, it only serves to explain why we have been successful at what we have been doing.

One of the accepted principles of metal cutting is that

CREATIVE ENGINEERING

*Up To A Point, Tool Wear Is Directly
Proportional To Temperature, Then—*

the combination of a high rate of feed and a large depth of cut at a low cutting speed will allow the greatest amount of metal to be removed for a given tool life. With broad but finite parameters this principle can be proved mathematically. The mathematics involved are relatively simple and have been developed empirically. The actual formula is an extension of the Taylor equation:

$Vt^n = C_t$ (1) and may be written

$$V_t = \frac{C_a}{d^x f^y}. \quad (2)$$

In this form the V_t represents the speed at which a given tool life may be obtained. C_a is a constant dependent on machine and work material variables. d and f are the depth and feed, and x and y are exponents. Normally the average values of the exponents x and y are accepted as 0.24 and 0.43. The relatively low value of these exponents, particularly that of the depth, demonstrates mathematically why more metal can be removed for a given tool life by increasing the depth and feed than can be accomplished by increasing speed.

Recently, through metal cutting research, more evidence has been established to support the principle of increased feed and depth at moderate speeds. Work done by Professor K. J. Trigger and B. T. Chao of the University of Illinois on tool-chip interface

temperatures has revealed a close relationship between cutting speed, tool life and temperatures at the tool-chip interface.

It has long been known that temperature was closely related to tool life. In fact the terminal point of a tool was and still is frequently described as the time when the tool is "burned up." In high speed steel, the term "red hardness" is intended to describe the metallurgical property of retaining hardness at cutting temperatures. This term might also apply to cemented carbides but usually carbide fails through a more complex high-temperature phenomenon rather than just simple loss of hardness.

Professor Trigger concluded from his research that carbide tool wear is directly proportional to temperature until a certain temperature is reached. At this temperature, which he has defined as the "critical temperature" the wear rate changes abruptly and the tool quickly fails. The wear referred to here is specifically crater-wear, but current investigations indicate that the same phenomena apply for edge-wear.

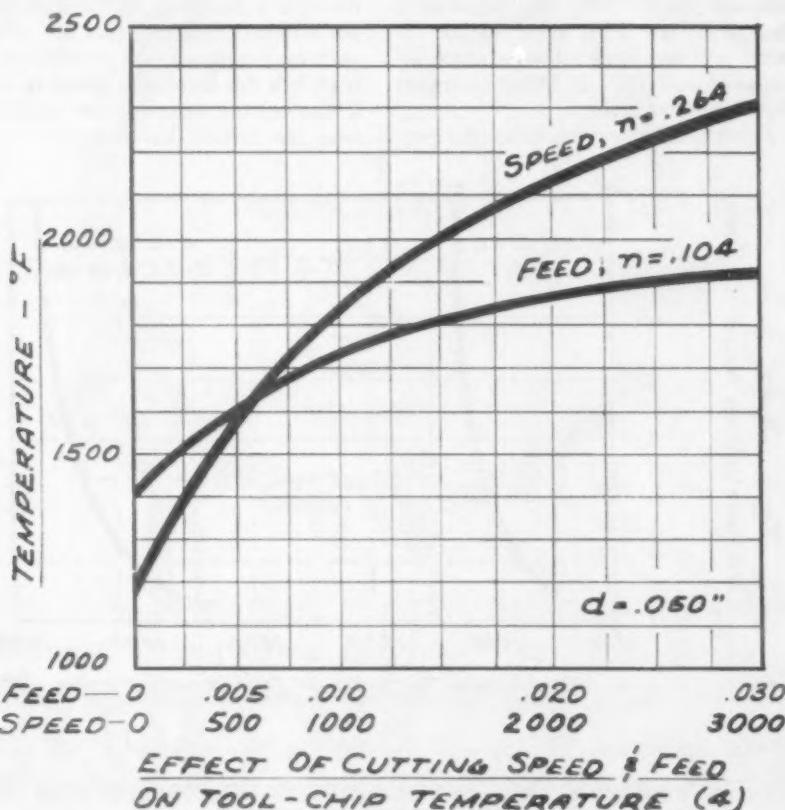
Since it has been demonstrated that temperature has a significant effect on tool wear it is in order to examine what relationship there is between feed, depth and speed and cutting temperatures. Depth of cut has negligible effect on the tool-chip interface temperature when the depth is any value greater than two times the nose

radius. It may be concluded therefore that depth is the least significant factor in cutting temperatures and in tool wear. This conclusion is supported by the low value of the exponent applied to the previously stated equation.

The speed and feed, however, have a much greater effect on cutting temperature and since they are usually the independent variables which are

most often manipulated in a cutting operation, a comparison of their effect on cutting temperature is of importance.

Figure 1 shows a plot of cutting temperature versus surface speed and feed rate. It is obvious that comparable changes in speed and feed do not produce comparable changes in temperature. This is evident from the value of the slope of the curves, 0.264



1. The plot of feed versus temperature and speed versus temperature graphically shows why feed has a less significant effect on cutting temperatures and corresponding tool life.

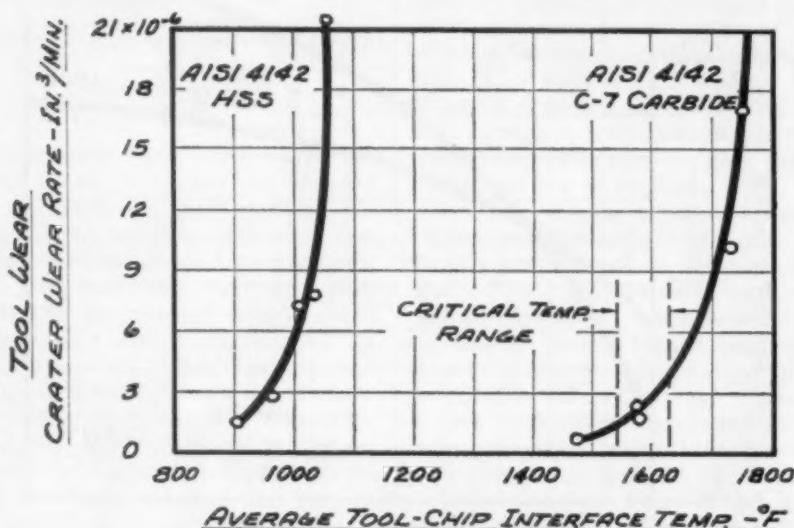
CUTTING TOOLS continued

for speed and 0.104 for feed.

By arbitrarily selecting any set of conditions with respect to feed and speed it can readily be determined from the graph that if the speed is doubled the temperature increase will be approximately twice what it would be if the feed were correspondingly changed. A change, 250 to 500 sfm, for instance, will raise the cutting temperature about 200° F, whereas a change in the feed from .0025" to .005" will result in a temperature increase of only 100° F. Other examples show a similar ratio.

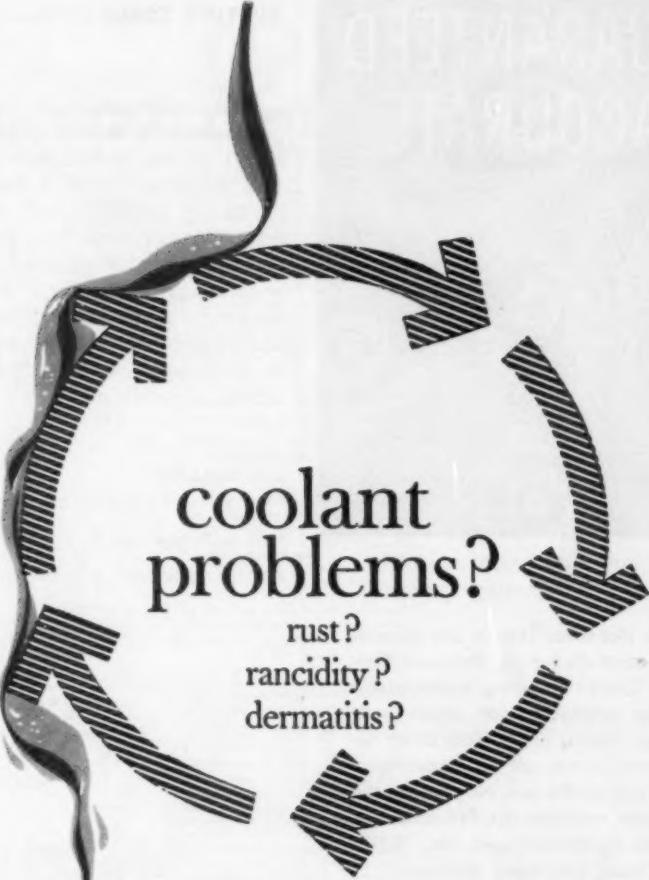
Since temperature, notably the pre-

viously defined "critical temperature" establishes an operating limit with respect to acceptable tool life, it is more desirable to increase the feed than the speed if a higher metal removal rate is desired. This procedure will, of course, affect tool life but not nearly as drastically as will comparable increases in speed. In other words, the metal removal rate may be doubled through a doubling of the feed while not seriously reducing tool life, whereas it may not even be possible to accomplish this through a speed increase if the cutting temperature is already near the critical value.



DEPENDENCY OF CRATER WEAR RATE ON AVERAGE
TOOL-CHIP INTERFACE TEMPERATURE (3)

2. This plot of tool wear versus average tool-chip interface temperature reveals the abrupt change in tool wear when the critical temperature is reached.



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CUTTING TOOLS continued

This relationship of cutting temperatures to tool life, speed, feed and depth of cut is therefore compatible with what has been a long-accepted operating principle and serves as a scientific explanation for what we know to be good practice. This type of metal cutting research is being conducted by many interested universities and corporations throughout the world to help make metal cutting a completely scientific and predictable operation.

• • •

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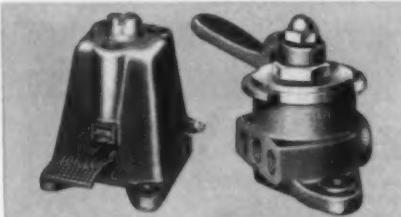
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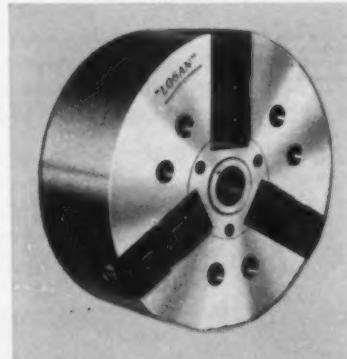
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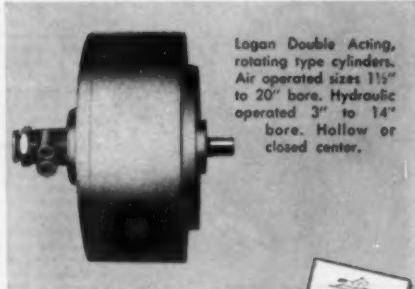
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MACHINE and TOOL BLUE BOOK

By Allan Young
Process Engineer
Collins Radio Co.

6

PROCESS ENGINEERING



How Can You Be Certain That Your Manufacturing Method Is The Best Method Possible?

PROBLEM—As there is more than one way of skinning the cat, there is more than one way to manufacture a part.

SOLUTION—Sit down and figure costs for every method, then project costs versus quantity. The answer may surprise you.

■ Which method is best, given a choice, to produce a quantity of parts? When does one method of manufacture become more economical than another? Though many firm's engineers do not take the trouble to find out, various methods of fabrication should be analyzed to select the best method—based on desired production quantities.

To make a comparison, many things must first be known. These include estimated cost of the various tools, run time in pieces per hour, cost per piece for the various methods of fabrication, and setup costs. All of these known facts can then be charted and projected to determine what is the quantity of parts at which one method of

PROCESS ENGINEERING

The need for a new piece of production equipment may be revealed by compiling a break-even chart

manufacture becomes economically better than another.

To illustrate the method of determining this "breakdown point," as it is called, the piece-part shown in Figure 1 will be used. This is a simple sheet metal part, made of .032" thick yellow brass. The physical operations needed to produce this part are to

pierce or drill the holes, notch or trim to shape the contour, and then form one side up 90 degrees.

Notching was chosen instead of blanking the part complete because the over-all tolerances on width and length are not tight enough to require blanking. A rectangular blank will be sheared to size, and then the further

Figure 1. This is the simple sheet metal part used here to illustrate how production requirements influence method of manufacture. Material is yellow brass, .032" thick.

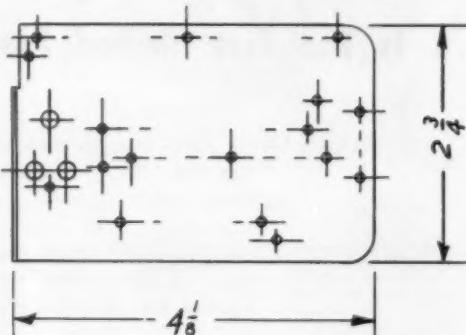
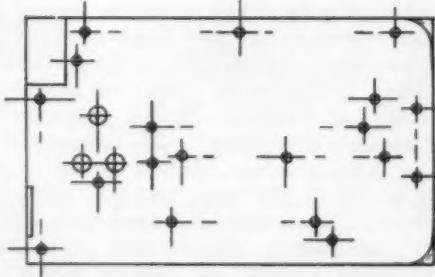


Figure 2. The same part, in the flat, with the areas to be notched indicated at the corners. Operations needed to produce this part are: pierce or drill the holes, notch or trim to shape the contour, form one side to 90°.



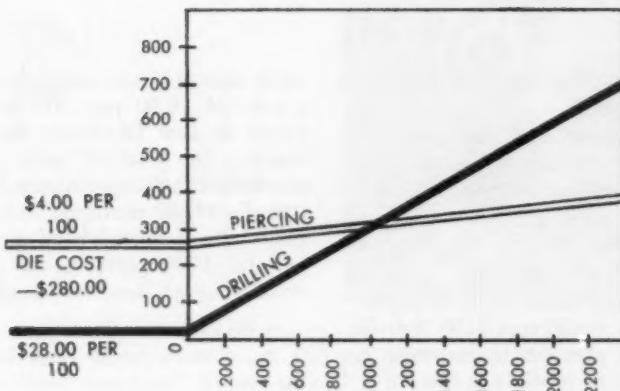


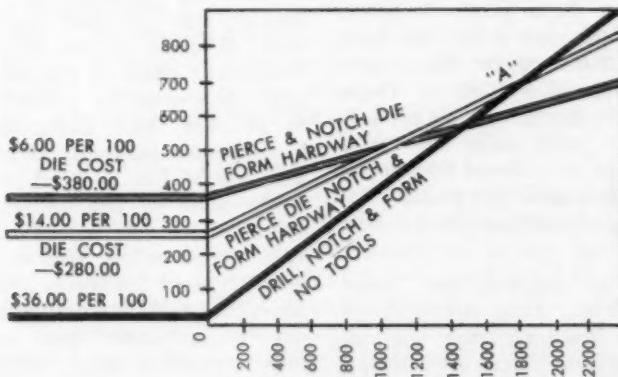
Figure 3.

fabrication will begin. Figure 2 shows the part in the flat with the areas to be pierced and notched shaded.

The graphs shown in Figures 3, 4, and 5 are used to indicate total cost in dollars (including tool cost) for various quantities of this part.

In Figure 3 one line indicates the cost of parts run on a numerically controlled drill press. This operation

is to drill all holes in the part, three parts in a stack. Another line indicates cost of producing the parts by piercing all the holes in a simple low cost piercing die. The holes can be drilled at a cost of \$28.00 per 100 with a very minimum allowance for tooling (preparation of the tape, programming, etc.). The cost per 100 parts in the piercing operation is \$4.00 but the



Figures 4 and 5.

cost of the pierce die (\$280.00) must be figured in.

This indicates that the first 1100 or so parts can best be produced on the drill press, but beyond that figure (where the lines cross) we can well afford a pierce die and the parts will cost much less in the total.

For a comparison then, a quantity of 600 parts would cost \$188 if drilled and \$304 if pierced. If, however, we should need to produce a quantity of 2000 parts, they would cost us \$560 if drilled and \$360 if pierced.

Figure 4 illustrates the comparison between various methods of producing a complete part, whereas Figure 3 deals with putting in the holes only. One line indicates a cost per 100 of \$36.00 for drilling in the tape controlled drill press, notching on standard equipment (no tools involved) and bending the lip in a press brake.

This method is economically sound until the intersection of the lines at "A" is reached, meaning that at a quantity of 200 we should at least make a pierce die to pierce the holes, and still notch and form the hard way. Cost of the pierce die, as previously mentioned is \$280.00. These two lines indicate that we are producing complete parts under the methods mentioned at a cost of \$36.00 per 100 by drilling and \$14.00 per 100 by piercing, in addition to the cost of the die.

Now let us consider the "Form Hardway" line. This method of manufacture indicates that we can add the expensive hardway notching operation to the pierce die for another

\$100 and produce completed parts at a cost of \$6.00 per 100 in addition to the die cost. Obviously then, we are beating the cost of both the other methods at a comparatively low quantity. For 1200 parts, we can beat the pierce die and notch hard-way method and for 1700 parts we can beat the drilling, notch hard-way method.

Note that the pierce and notch die is more economical than the pierce die, notch hard-way method at the point where it beats the drilling, or "no tools" method. This means to us that a die for piercing only would be uneconomical at any quantity for this part.

So far we have always considered bending the lip in a press brake, and up to a very high quantity this will prove to be the best way for this part. However, a more complicated formed part might be produced complete in a progressive die for a fairly low quantity. This *type* of graph would indicate what this quantity would be.

All of the foregoing figures are not actuals; they are used for reference only. Whether or not this type of "breakeven chart" is prepared, it certainly behooves the process engineer to at least think along these lines to determine feasibility of production methods he has in mind. A detailed study made on this format is sometimes necessary to prove the economic value of so-called hard-way or "no tools" type of fabrication, and often times the need for a new piece of production equipment, such as numerically controlled machines, can be proven in this manner. • • •



"If any manufacturer wants to reduce his manufacturing costs with cost-cutting equipment he'll find the answer in Chicago this September."



7

LEADERS OF THOUGHT IN INDUSTRY

Alan C. Mattison

President, National Machine Tool Builders' Ass'n.,
in an interview with William F. Schleicher

Q. In the five years since the last Machine Tool Exposition, which direction have the builders taken in machine tool developments? Will we see the results of their five-year long effort in Chicago this September?

A. Yes! You will see many new developments which are the fruition of five years of planning and designing. Unquestionably, the glamour machine tools, such as numerically controlled machines, will be much in evidence. This tape controlled equipment can really perform when utilized wisely. You'll also see steps in the direction of the completely integrated process.

Q. Completely integrated process?

A. Where one machine performs various operations. I don't mean a special machine, but rather one machine tool where the tooling is so arranged that boring, drilling, milling, or other operations may be performed on a part without removing it from the machine.

There is a definite, but rarely thought of problem in the manufacturing of delicate instrument and missile parts. The problem comes up when handling these delicate parts

BLUE BOOK REVIEWED



On the subject of productivity . . . "higher wages do not mean increased purchasing power, they simply mean higher costs and higher costs mean higher prices, resulting in inflation. The purchasing power can only come as a result of low-cost production."

through various operations and various machines and in transporting them all over the shop. To prevent damage to the delicate parts, special cushions, expensive trays and other ingenious and protective means must be used. Well, with a machine which performs several different kinds of operations on one part, much of this carting about is eliminated.

Q. To say nothing of the increased productivity?

A. That's right. You'll also see a fine display of special machine tools which have been designed for one particular job; furthermore, there'll be many tools, which are special, that can be adapted to several different jobs. There will also be many new ideas on standard machine tools.

Q. What is the outstanding over-all development on standard machine tools?

A. There will be fewer frills and less of the nonessential on standards. Basically, what every builder has tried to do is reduce the floor-to-floor-time. For many years the builders have done a fine job of removing metal—after all, that's what a machine is supposed to do. But like air travel, you can get to where you're going in a hurry, but it takes longer to get to the airport. Machines have, in some instances, suffered from the same malady—it's taken too long to get the part on and off the machine.

There's been a tremendous concentration in the past few years to reduce the handling time, before and after machining. This has spilled over into gaging and you'll see much automatic size control. Many machines will be equipped for this; however, if you don't want automatic sizing right away, provisions have been made on the machine so that it can be attached at a later date.

Our machining techniques are excellent; from now on we must reduce floor-to-floor time. Our tooling, or rather, the tooling of American industry is excellent, although we can do more with automatic loading and automatic setting-up.

Q. Will we see developments along these lines at the Exposition?

A. Yes, you definitely will. Everything the builders have tried to do in the last five years can be summed up by saying that industry must do a better job faster and it must do it cheaper.

Another aspect that's becoming more and more important is the cost of assembling. Here's one area that industry has not investigated thoroughly. Tremendous savings can be realized here.

Q. How does this affect the builders and the machines we'll see?

A. To improve assembly you must become as automatic as possible and apply the same labor-saving thinking to that phase as you have in the past applied to machining. This means, in turn, that parts must be of unvarying accuracy. Machines must produce to closer tolerances. Some of the larger transfer type machines are beginning to have several assembly operations built in. This will be expanded and it will be a big thing in the future.

Q. There really is very little automatic assembling of mass produced products being done today. When one realizes that 50 to 70% of the manufacturing cost

of a part goes into assembling, one can appreciate that it is a big field.

What other areas will show improvement in standard tools?

A. Basically, they will be in the area of higher quality, reduced maintenance, easier accessibility, and higher operating efficiency. Each manufacturer will have his own developments there and I cannot say exactly which specific direction the individual builders will take.

Q. The machine tool industry has been hit by imports, hasn't it?

A. Just as almost everyone else, yes. We've lost many of our foreign markets. America is pricing itself out of the world market, not only in machine tools but in many other industries as well. This is not getting any better, but is getting worse.

Q. What do you think of the future regarding this situation?



"America is pricing itself out of the world market, not only in machine tools but in many other industries as well."

Why isn't our economy benefiting

A. We'd better wake up and get to work. And this means everyone! Unless we produce better and cheaper, unless we can start bringing our prices down, all of American industry is in for a rude awakening.

The Europeans think we have holes in our heads, increasing our prices

even while we increase productive efficiency.

The entire economy should benefit from higher efficiency. But that's not true today. There are two fallacies: One, a higher wage does not mean increased purchasing power, it simply means higher costs and higher costs

About Alan Mattison

Alan C. Mattison, President of Mattison Machine Works, Rockford, Illinois, was born in Beloit, Wisconsin, where his grandfather, Chris Mattison, had founded the company in 1896. He follows his father and grandfather as president of the company.

Mr. Mattison attended Cornell University, graduating with a degree in mechanical engineering. His entire business career has been spent in the Mattison Machine Works. After gaining experience in the various departments of the company he was made president in 1948.

He is a Director of Cinrock Machinery Inc., AMTEA Corporation, Mattison-Greenlee Service Corporation, and the Illinois Manufacturers'

Association; and is a member of the Woodworking Machinery Manufacturers' Association, the American Society for Metals, the American Society of Mechanical Engineers, and the National Association of Accountants.

Active in local affairs, Mr. Mattison is president of the Rockford School Board, a Trustee of Rockford College, First Vice President of the Rockford Memorial Hospital, Director of Junior Achievement of Rockford, Inc., and Past President of the Rockford Chamber of Commerce.

Mr. Mattison was elected President of the National Machine Tool Builders' Association in November, 1959.

from higher efficiency?

mean higher prices, resulting in inflation. True purchasing power can only come as a result of low-cost production.

The second fallacy that we indulge in is to believe that the increases of productivity are entirely due to labor. We in the machine tool industry know that increases in productivity in recent years have been due almost entirely to advances in technology—to the development of machines, equipment and processes which have resulted in greater output per man-hour. Therefore, if we would stabilize wages and translate increased productivity into lower prices, we would place ourselves into a competitive world position again.

Q. Are the Europeans beginning to face the same situation?

A. Yes, in Germany labor is beginning to be restless. At the present time there is no unemployment in Germany which means that in labor the law of supply and demand will enter. Due to the shortage of labor the cost of labor will go up and as soon as this happens prices will advance and Germany will face the same situation of increased prices.



"Our machining techniques are excellent; from now on we must reduce floor-to-floor time."

Q. Isn't Europe more material-cost and tooling-cost conscious?

A. They have a material-cost problem and quality material is at a premium. Much of their effort is devoted to conserving material. Their tooling is also more expensive and because tooling saves labor (which is, relative to tooling, pretty cheap) they don't go in for it the way we do over here. For us, tooling is inexpensive in relation to labor cost and we will apply good tooling to bring labor costs down. If we can bring our labor costs down and European labor costs go up we will have a fighting chance. It won't be easy and it will still take a lot of hard work on our part.

Q. Are American machine tool builders hampered by foreign import licenses, and taxes and tariffs?

A. We were, several years ago, and still are, in spots, but most of these were removed when the Euro-

LEADER OF THOUGHT continued

peans discovered that they were not necessary. Our prices are so high that Europeans removed the barriers.

Q. Do you believe that tariffs and additional taxes on imported goods will help American industry?

A. Speaking only from a personal standpoint, I would say that tariffs are not the real answer to the problem. We've got to become competitive again, our prices must come down. Once they do, we'll sell equipment in the world. Our American machine tools are still, from the over-all view, superior to the rest of the world which have copied many of our designs and ideas.

Q. Some of our readers wonder why no foreign equipment is being shown at the forthcoming exposition.

A. For only one good reason: There's not enough room! We actually don't have as much room as the American builders want. Everyone wanted more space, but it had to be judiciously allocated and controlled. If anyone thinks we're keeping foreign builders out for any other reason I want emphatically to state that the problem is one of space, and the size of the exhibition hall.



"We'd better wake up and get to work. And that means everyone!"

Q. All in all, it should be a good show in September.

A. It'll be a whale of a show. If any manufacturer wants to reduce his manufacturing costs with cost-cutting equipment, he'll find the answer in Chicago this September.

• • •

Questions About The Machine Tool Exposition—1960 are answered in a booklet available from The National Machine Tool Builders' Association. If you plan on attending the show or are still undecided you will want a copy of this booklet. In addition to descriptions of why, what, and where, the booklet lists hotels and motels in Chicago and suburbs (with price ranges normally charged). Each booklet features tear-out Inquiry Time Saver Plate application forms and forms for obtaining Rapid Registration Cards. Send requests to National Machine Tool Builders' Association, 2139 Wisconsin Ave., N.W., Washington 7, D.C.

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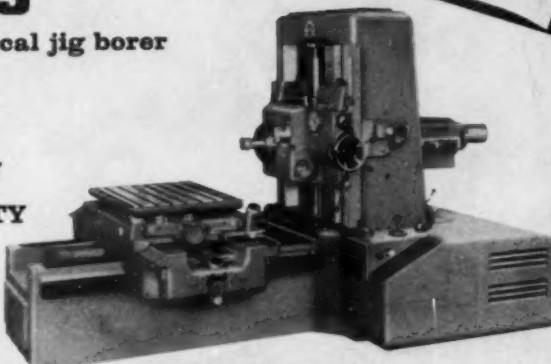
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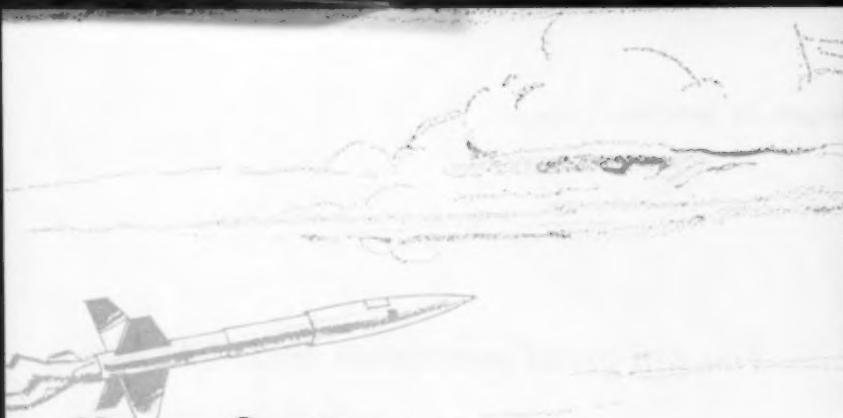
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Nose Cones... A Study In Grinding Technique

So fragile, hold down screws have pre-set torque ratchets; so accurate, variable wall thickness must be determined electronically.

By **Darrell Ward**, Engineering Editor, in an interview with
M. E. Passmore, Chief Process Engineer, Missile Systems Div.,
Raytheon Manufacturing Co., Bristol, Tennessee

■ Developments in the missile field are of such magnitude and so dramatic, that frequently specific engineering problems behind these developments become lost in the headlines. One such problem was the grinding of the ceramic nose cone of the Sparrow III missile.

The new missile is so fast that plastic and other synthetic materials will not withstand the generated heat of air friction, yet the nose cone must be made of non-metallic material to permit transmission of radar waves (hence its designation as the "Radome"). The part is made of aluminum oxide, "an extremely difficult material" to machine or grind to the exacting dimensional tolerances required.

How do you handle aluminum oxide ceramic grinding, especially in a part which requires considerable stock removal and turns up in irregular shapes as a result of kiln warping? The part is approximately 8" O.D. x 18" long, fired at 3150°F. Its hardness is 9 on the Moh scale, approximately equal to sapphire. Brittleness is the major problem in handling.

You can grind aluminum oxide like butter,

The part comes in oversize from a West Coast vendor (Gladding-McBean). Approximately 0.050" of stock is to be removed on I.D. and O.D., but this varies considerably because of kiln warping.

Parts first are inspected for damage and for dimensional tolerances which will allow proper stock removal. They are shipped separately, but transferred to a 12-partition egg crate type dolly, figure 1, lined with polyfoam cushions, for handling in the Raytheon plant.

The part is chucked in a special holding fixture called a shuttle, figure 2. For preliminary locating, the part is suspended vertically from the center point inside the nose, then centered by four-cornered internal locators with carbide inserts. The locators are moved up and down on the I.D. until a barely snug fit centers the part. Then, the shuttle is brought down over the part and nested inside 3 hardened steel locators to center around the part.

Shuttle torque screws are tightened by means of pre-set torque ratchets which permit these screws to slip when slightly more than finger tightness is attained. Six screws grip the waist section, six on the skirt, and

three just back of the nose, figure 2. All 15 torque screws have a knurled-face brass clamping-pad which bears directly against the ceramic surface.

The clamped shuttle is removed from the locating fixture and turned on its side at the workbench, figure 2. An excess, approximately 1½" wide, of material projects beyond the shuttle and is later removed to true up the edge of the skirt and to bring the part to the correct length.

To retain this waste ring and avoid shattering when it is cut off, another fixture, called the cut-off ring, is brought into place against the bottom of the shuttle and clamped by means of six torque screws bearing against the surplus ring area, figure 2.

The chucked part then is ready for machining. The shuttle is lifted by a remote control overhead crane which serves six Heald No. 74 hydraulic tracer-controlled contour grinders.

The first operation is ring cut-off. The surplus ring is removed and a retaining plate is bolted to the shuttle to prevent the ceramic part from slipping out. After the ring is cut off, the skirt edge of the cone is faced so that 0.005" extends outside the shuttle face.

The shuttle is held in the machine

if you know how to handle it.

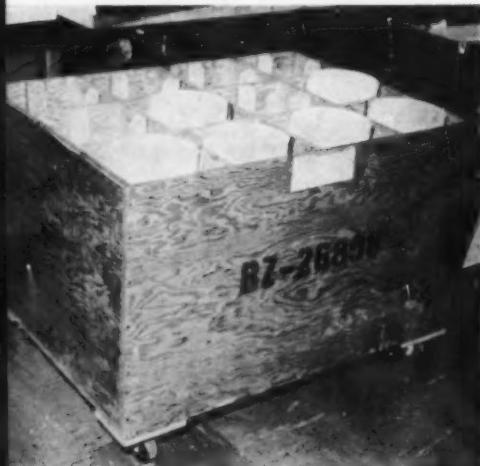
by means of a diaphragm chuck. The other end of the chuck is supported in the work position by two nylon bearings which ride against a precision bearing ring of the shuttle.

A longitudinal cross section through the Radome part shows the profile to be a true arc, not a generated shape. Therefore, machining is greatly

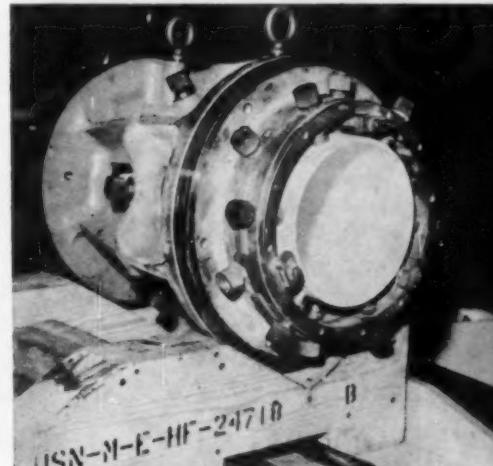
simplified, reducing the main problem to that of how to grind an extra hard ceramic and obtain a close tolerance profile. Continuous free cutting characteristics are essential.

The only wheel found to perform this internal grinding satisfactorily is a sintered matrix diamond wheel

Good grinding technique starts with . . .



1. SAFE HANDLING within the Raytheon plant by means of partitioned crates lined with polyfoam cushions.



2. MOUNTING the part in a special holding fixture called a shuttle. All 15 screws feature pre-set torque ratchets.

Infinite care each step of the way

(Koebel Diamond Tool Co.) normally made for wheel dressing. A 3 $\frac{3}{8}$ " diameter wheel is used to remove between 0.015"-0.020" to within 0.001" of finished size in an average of four successive cuts.

Wheels are changed to a 1 $\frac{1}{8}$ " diameter, similar to the first, to reach farther into the nose. The first wheel travels approximately 13 $\frac{1}{2}$ " in from the skirt. The second overlaps and moves in approximately 4 $\frac{1}{4}$ " more toward the nose.

Wheels are changed again to a 1 $\frac{7}{8}$ " diameter wheel with a 3" radius on the periphery to blend previous grinds. This wheel brings the I.D. to final size within $\pm 0.0005"$. The workpiece is checked by means of an air gage on a radius arm, the latter being checked periodically with an Invar master gage.

Another tool, a core drill, reaches up into the nose and relieves the nose tip for cone wheel grinding.

The next step uses a cone wheel, contour pointed, to finish off the last 1 $\frac{1}{8}$ " inside surface at the Radome nose.

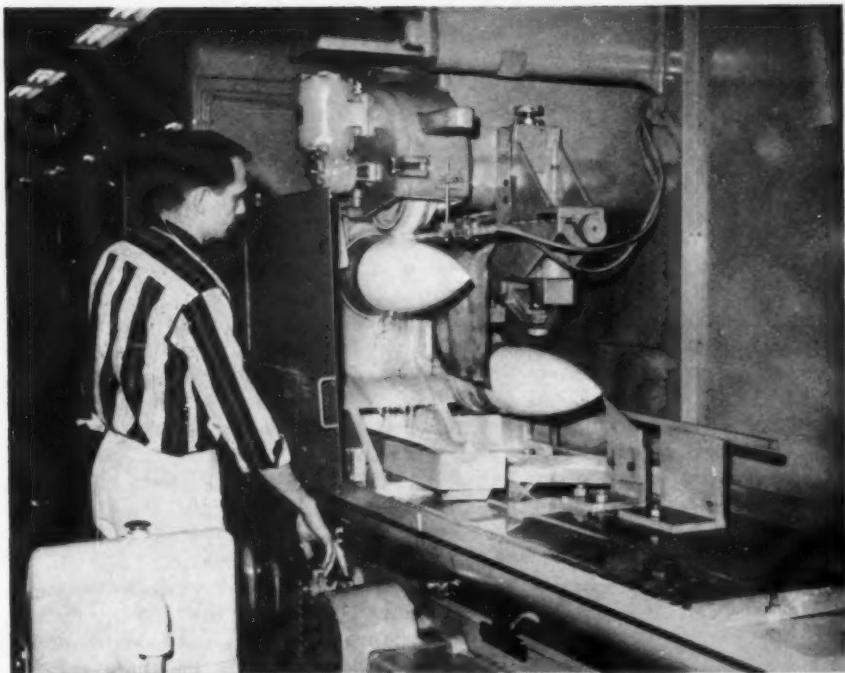
All operations are performed with a wheel spindle speed of 7,000 rpm. Infeed varies up to 1 ipm. The part rotates at either 62 or 115 rpm, according to wheel size.

The part is inspected while still in the shuttle by means of air gages and dial indicator bore gages before removing the shuttle from the machine (fig. 3).

External rough grinding is performed on one of four 30"x80"x32" Mattison hydraulic tracer-controlled profile grinders to remove 0.050" to 0.090" of stock, figure 4. Metallic bonded diamond wheels, 14"x $\frac{1}{2}$ ", at a spindle speed of 1750 rpm are fed



3. GAGING is performed while the fragile ceramic nose cone is still in its shuttle. Shown here, an air gage prior to inspection.



4. ROUGH GRINDING, on a Mattison hydraulic tracer-controlled profile grinder, is done with a metallic bonded diamond wheel. Workpiece is indexed 250 steps per revolution.

at approximately 1 ips. The workpiece is index rotated with 250 indexes for one full turn. A shift lever provides for indexing 1, 2 or 3 steps per machine stroke as desired.

These wheels also are stick dressed with a Norton Crystolon stick dresser, approximately once for every 25 workpieces.

External finish grinding is performed on a special Radome grinder developed by Mr. Passmore, Raytheon's Chief Process Engineer, and built by International Tool Co. of Dayton (figures 5 and 6). This machine takes advantage of the cone's

profile which is of true arc shape. The grinding head swings on a radius arm, whose length coincides with the projected radius of the Radome profile. Therefore, as the grinding wheel head moves back and forth with the part held in the headstock spindle, the proper shape is automatically developed. The cone is held on the mandrel by vacuum and released by air pressure.

Feed rate for finish grinding is variable up to about 3 ipm with an 8" wheel rotating at 2800 rpm. The wheel is 100 grit, 150 concentration. The face of the wheel, inherent in

*Patience and ingenuity are needed when
grinding hard and brittle workpieces*

the operation of the machine, is normal to the contour surface of the Radome at all times and, therefore, produces a better quality of finish than would otherwise be obtained. Specified finish is 125 rms.

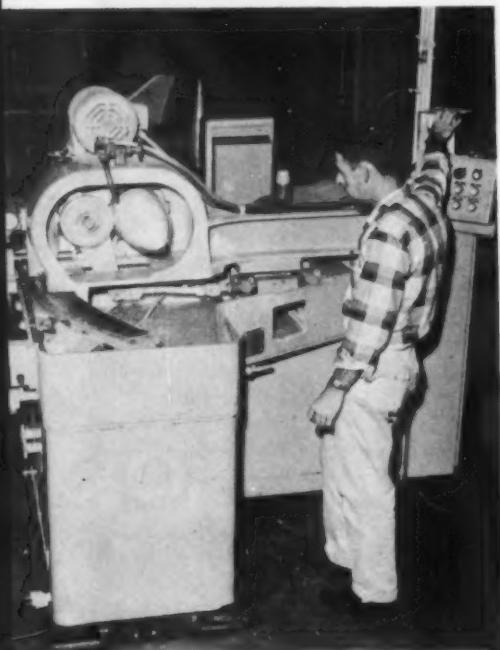
The special grinding machine now used as the finish grinder was originally designed for refinishing Radomes to pass the electronic inspection test. For an average grinding shop,

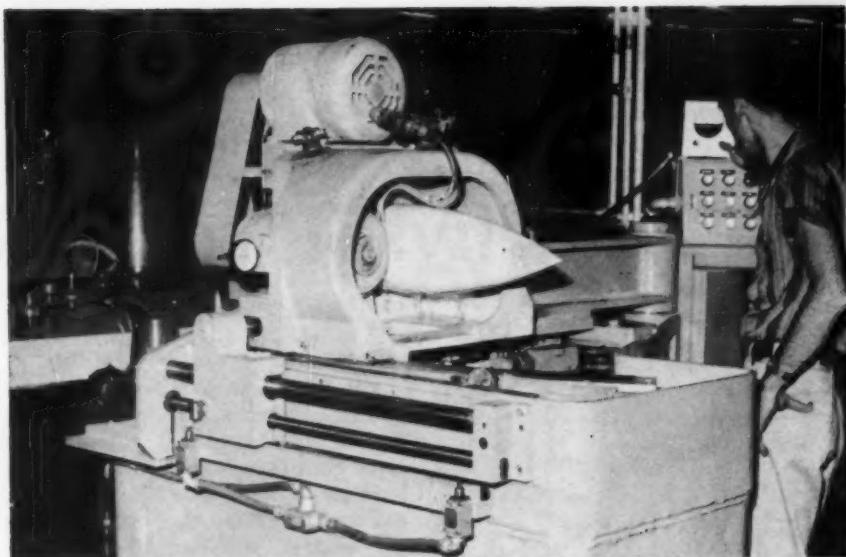
the tolerances required in the variable wall thickness would be unbelievable and beyond all normal shop practice.

While the specifications are not available for publication, it is sufficient to mention that at this point in finishing the Radome, even the best of standard gages are of no further use. Final testing depends entirely upon the dielectric characteristics of the ceramic, gaging being done by measurement of electromagnetic wave transmission through the Radome wall. Finish grinding must be gaged to the effective dielectric wall thickness, not to dimensional specifications. The Passmore grinder will perform this function, holding rejects to a minimum. And, most rejects from the first electronic test usually can be refinished to final tolerances.

Since most of what we observed in the plant, and many data normally discussed are classified, it is not permissible to disclose further information on this case history. However, Mr. Passmore was generous enough to sum up the basic problems encountered in the Radome contract and to throw out a few shop hints he discovered.

5. FINISH GRINDING is performed on a special grinder developed by Mr. Passmore. Note how grinding wheel swings on a radius arm to grind the cone's arc shaped profile.





6. FINAL GRINDING to size is achieved by measurement of electromagnetic wave transmission through the Radome's wall. The final thickness is the effective dielectric wall thickness, not to dimensional specifications.

The part is extraordinarily hard and brittle. Therefore, every precaution must be taken to avoid fracture. Wood work bench tops, wood cradles, foam padded stock dolly, and similar provisions around the shop have eliminated most handling hazards. The possibility of fracturing and the need for absolutely no distortion of the part in final grinding gave rise to the vacuum chucking method used on the Passmore grinder.

Because of the variable wall thickness and unusually close tolerance required, as well as the brittleness of the part which will permit no chatter, wheels must be trued to as nearly zero run-out as is physically possible.

In addition to this, the wheels must be very free cutting. The ones used at Raytheon are matrix relieved to

provide for this characteristic. Cimcool was found to cut cleaner and freer than other coolants tested.

Matrices of the wheels must be kept extra clean to avoid build up and excessive pressures. Mr. Passmore found that when his wheels were cutting properly, they were bearing against the mandrel mounted part so lightly that the mandrels were deflected less under cutting pressure than they can be deflected by the pressure of a finger against the part. This was measured and demonstrated with sensitive dial indicators.

"Ceramic grinding of this kind is not as hard to do as most people think," Mr. Passmore said. "But, it requires more ingenuity and patience than many people are likely to exercise." • • •

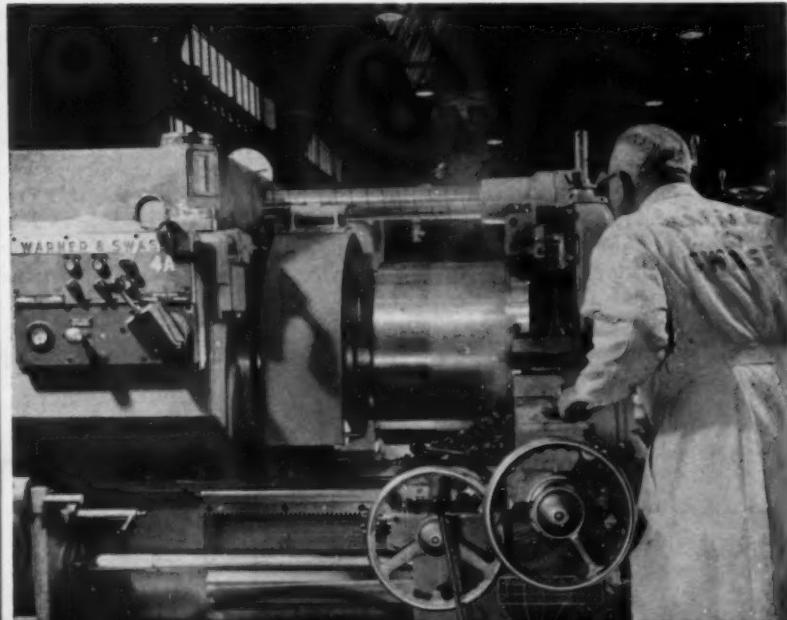
Everything else is running faster . . .

Why Slow Down

By Horace Frommelt

■Cutting-off from bar stock, or "parting" as it is sometimes called, is one of those machining operations that is suddenly crying out for some kind of serious attention. The need for a new cut-off technique is critical; tooling for bar and chucker and multiple spindle machines has suddenly graduated into the carbide class. A whole series of operations will be hog tied by the cutting-off operation unless something is done to make carbide as effective in this aggravating

1. All tooled with carbide, but what about the cut-off blade?



For The Cut-Off?

and irritating operation as it is in others.

Facing, turning, boring, plunge and other types of tools are now recognized, at long last, as entirely suitable for carbide. The latest versions of chuckers, bar and multiple spindle machines are equipped spindle-speed wise as well as having power to take on carbide tooling; until unfortunately there is need for drilling or cutting off. Then, speeds must go back fifty years to accommodate the high speed cutting materials. In some of the later machines, of this class, the speeds of individual spindles are individualized, that is, they can be set separately and independently. Thus it becomes possible to run the customary 300 to 600 sfm for the traditional operations such as turning and boring, while hobbing, drilling, and cutting-off are run at the 60-100 range. Obviously there is much time lost here. In addition, the machine down time debit is increased solely because these tools will require more attention, particularly when up against tough materials such as the stainless 300 and 400 series.

The next step in this slow evolutionary process of rapid cut-off is the use of the brazed carbide cut-off tool. This is in the right direction but does



2. As cutting speed decreases towards the center, cutting forces rise tremendously. Good thing that the material gives way to the cut-off blade!

not go nearly far enough. Again the difficulty arises from the fact that when clamped-on indexable tools are used for the other operations, then the brazed tool cries out for attention about twice as often as the clamped-on variety. Where can we go from here to get better economic results?

The Answer Lies In The Problem

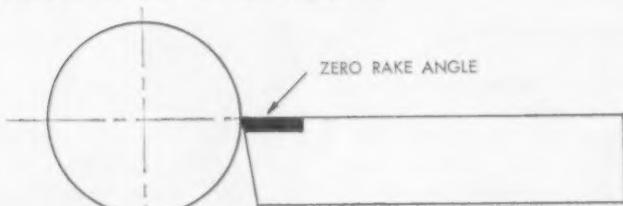
Before discussing the latest developments along the lines of cut-off tooling a look at the technical problem involved in parting will help. A look at Figure 2 brings home the problem immediately. A sfm rate is chosen—and here let us suppose in the neighborhood of 300-500 for this material and the type of carbide, etc. For the outer circumference this sfm

FAST CUT-OFF continued

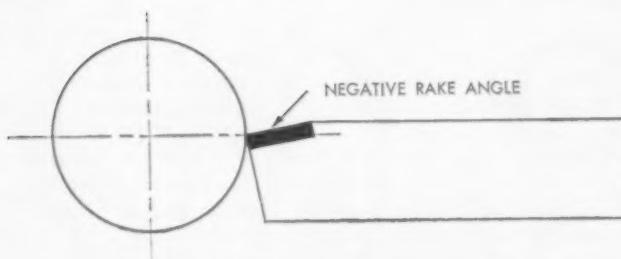
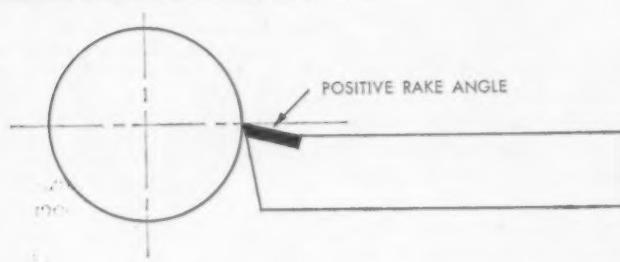
Your choice of tool geometry is important



3. A slight lead angle should be used to ease the blade into the cut. Pressures are easier on the machine, too.



4. Zero rake is standard for cut-off tools.



5. Non-ferrous materials? Maybe the positive rake will perform better. Ferrous materials might find the negative rake a better performer. Type of machine used has an influencing affect on selection of tool geometry.

rate will be proper and fitting; but as the tool moves toward the center the sfm rate drops off, continuously adding difficulties with each infinitesimal drop in the feet per minute rate of parting. As the center is approached, where the speed is mathematically zero, the pressure will rise towards infinity. Before the center is reached by the parting tool, the cutting pressure has increased to the point where the material lets go—if the tool has not already done so—leaving the little telltale "tit." See Figure 2.

Such shenanigans are obviously devastating to any cutting material, particularly to carbide. Compromises must be made between maximum and minimum, but the plain fact to be faced is this: as the tool reaches center or close to it the pressures are unconscionably high. Thanks to present day carbide the workpiece lets go first and the tool stands up, not as long as it should but reasonably so.

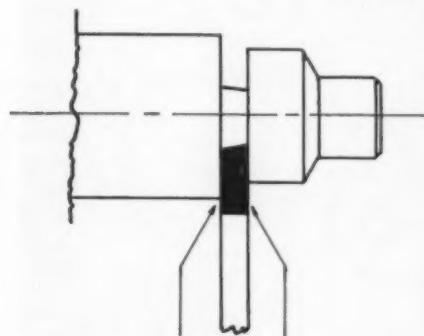
Under the stressed condition of the carbide due to brazing, the parting

operation demands attention three to four and more times than do other tools. What is being done for the harassed productionist? Another look at some of the parting tool geometry, that by experience and common sense has proven worthy of consideration, will be helpful.

Tool Geometry Equally Important

A slight "lead" angle should always be incorporated into the grind, as shown in Figure 3. Here the blow to the edge is applied gradually; the lead point enters first and then, by degrees, the entire cutting edge of the parting tool. Whereas with a no-lead tool, the entire edge is slammed into the work with resultant terrific shock to the tool and the entire mechanism.

Usually a zero angle tool signature is employed, as shown in Figure 4, on cut-off tools. This is generally acceptable, however, the following exceptions might profitably be noted: A positive angle as shown in Figure 5 may be specified but apparently only seldom is, and then on special non-ferrous materials. The tendency for the tool to "grab" the work piece (the bar) is frequent, with bad results all around. In spite of the obvious disadvantages of the negative angle, it is frequently specified for ferrous (and special materials such as the stainless) and other austenitic, non-magnetic components. The plain and obvious advantage is the "pushing away" of the workpiece from the tool and the elimination of the cutting-off or parting tool's tendency to "grab." Much of this must be played by ear—as you go on into the jobs the way



6. Side rake for the cut-off tool should be zero to prevent tool wander during the cut as pressure increases.

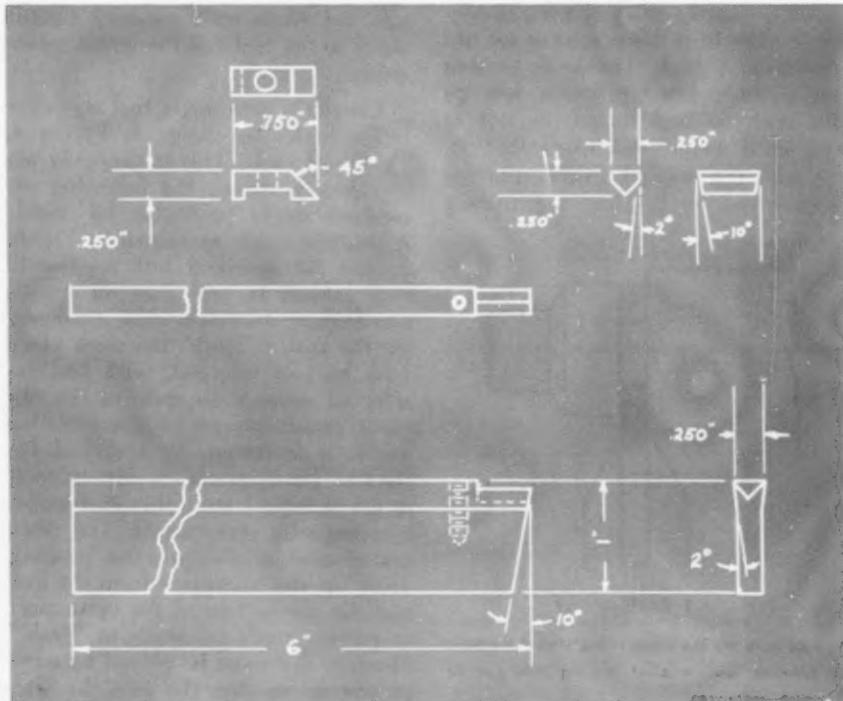
Cut-off tool of the future, with

will be indicated so far as angles are concerned.

Apparently, and this is from experience, the choice of cutting angles, whether zero, positive or negative, will depend to some extent on the type, kind and condition of the bar,

chucker or multiple spindle machine. Some machine tool mal-adjustments may be countered simply by employing a negative angle on the cutting tool; though this is a poor way and excuse for not keeping a machine in adjustment.

7. Toolholder designed to take advantage of special indexable carbide inserts.



indexable carbide blades!

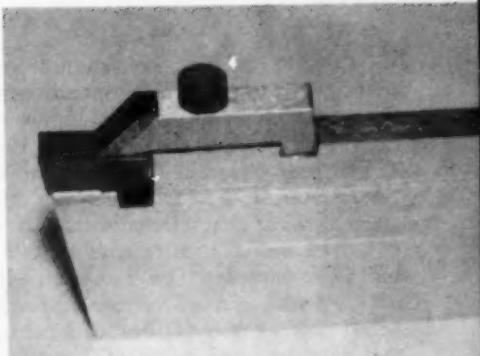
How About Side Rake?

The next important piece of tool geometry to remember in cutting off or parting is the elimination of the side rake. This is shown in Figure 6. Clearances along the sides of the cutting element are specified only for grooving tools, rarely for parting tools.

The apparent justification runs something like this: The tendency for the parting tool to "walk" in the cut, shifting pressure from one side to the other with harmful side cutting pressures on the carbide, makes it necessary to keep clearance out of the side edges of the parting tool. This latter is a must: No clearance for the side cutting edges of the parting tool!

The "Ideal" Explained

And now before going on to the latest development in parting tools using clamped-on carbides, an observation concerning a much-needed development machine tool wise may be in order. No matter what is or will be done to make parting a better job and give it some metal cutting religion, it will always be a wayward child. No amount of doctoring will eliminate the plain, unnatural, untechnical aspect of this kind of cutting—namely where the sfm rate decreases towards the center.



B. Not just theory; here's one ready to use.

And it is in the very nature of the beast that it so remains. There is a solution but that depends on the machine tool designers. The only sensible method of cutting off is by sawing. Today with the solid carbide saw available in thicknesses down to $1/32"$ such a tool would be a godsend on every bar, chucker and multiple spindle machine. Obviously there are difficulties: the saw must be set up on some form of cross slide to feed into the bar or workpiece. The problem of space is paramount and is recognized. But with some thought devoted to this problem, the current difficulties in the operation of these multiple spindle and multiple head machines will be, if not eliminated, at least reduced.

Clamped Carbide Inserts

Since the addition of a cut off saw, separately driven and separately fed (all automatically arranged) is far off in the distance, let us take the next best solution: the parting tool with clamped-on carbide. Thus the vexing operation of slugging or parting will

FAST CUT-OFF continued

be brought in line, considerably at least, with other carbide operations—facing, turning, boring, etc. Figure 8 shows such a tool that has been designed and tested with good results. A close-up of the tool will bring out the following characteristics: this is a $\frac{1}{4}$ " kerf tool for parting with solid, indexable carbides. The shank is made of a special mix of copper impregnated powder iron (CIPI), of a psi in the neighborhood of 90,000 sufficiently strong for all pressures to which these tools are subjected. The clamp is integral with the chip breaker, a piece of carbide brazed to the clamp serving for this purpose. A 6-32 hold-down screw does the job, as proven in shop applications. Note from Figure 7 that the carbide nests in a V-pocket. This prevents tacking and sideways movement. The carbide blade obviously can be indexed once; two edges can be used. Grinding of the edges can be resorted to but only if the blade is backed up after shortening. If not so held, it will move in the cut to the damage of the blade, holder and perhaps the workpiece.

All Should End Together!

With this type of parting tool, the cycling time is brought into synchronism with the other operations. Thus troublesome downtime is held to

a minimum. It is even preferable, from experience, to sacrifice something in sfm rate for all the tools, say 15% less, and thus bring the wear point for all tools at about the same time on the time curve or cycle. So important is this downtime on an expensive multiple machine that it is better at times to slightly sacrifice speed on all operations to bring the tool life time of all tools in the multiple set-up together and coinciding. The obvious advantages of the non-stressed carbide blade over the brazed tool need not be elaborated on here. In practice the data proves the advantages and the necessity for doing something about this cut off business.

What About Drilling?

If only something could be done with the century-old business of drilling to get away from the "lazing" speeds of high speed steel drill as compared with the other tools that have been given a dose of carbide religion! So far nothing is on the horizon. The machine tool designers have come up with the assist of making spindle speeds independently variable. Thus the drill can be operated in the 60-100 range while the other spindles are running at 400-500 or better. Thanks for this improvement over tradition!

• • •

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Conclusion

What Do You Bend On A Bender?

Wrinkling, flattening, and distortion due to material variation are unnecessary and can be cured easily

By Darrell Ward, Engineering Editor

■ One of the more interesting bending problems in round tubing which looks rather simple on the surface is far from simple in either principle or in practice. This is the job of bending clad tubing. Clad tubing is required for a variety of products, usually to impart internal strength with economy to a structural member and retain external appearance or protection without the high cost of solid material. An example is found in the highly polished stainless hand rails used in buses. Solid stainless tubing would be too costly and plating wears too quickly. The solution is clad tube parts made by forming a base metal tube inside the stainless and bending the two together.

This simple job presents difficult problems—the dissimilar metals do not bend together under the same stress or with similar reactions. Even if the materials were the same, the outer tube would move at a different rate from the inner tube. And, in this case, the outer tube is of much thinner wall construction because of its cost. The combination of thinner wall and different metals makes it difficult to prevent wrinkles from forming during a bend.

Basic tooling can be in excellent condition and still produce flattening problems if the mandrel is improperly adjusted or improperly chosen

A similar problem was found in automobile tailpipes made of laminated construction. These were designed to deaden the sound. They solve acoustical problems nicely, but produce serious problems for production.

How do you bend two different tubes of different cross sections and wall thicknesses together to make a smooth curve in the part? It was found that much higher pressures were required, and the diameter of the tubing *must be somewhat reduced to make both inner and outer tubes stretch into the new shape*. Otherwise, excess slippage and wrinkles would appear. The tailpipe problem was solved on a bending press with a specially developed punch die and unusually high pressure on the wing dies. A beefed-up machine can be adapted to the job with special dies for the purpose.

Heavy Equipment Not Necessary

The stainless clad tube of smaller size is bent by many firms on a simple draw bender with the addition of a wiper die. This die would not normally be required for bends in ordinary tube of the same size and radius of bend. In this case the wiper die prevented wrinkling of the very thin outer tubing without reducing the diameter.

With or without the problems found in bending clad tubing, the wiper die

requires proper attention. The adjustment of a wiper die varies in the same setup for different materials.

In bending aluminum, for example, there is a problem with the low tensile strength of this material. With aluminum, too much pressure between wiper die and pressure die may make the workpiece pull apart as the bend progresses due to excessive friction.

To relieve this friction under high pressure, but still support the workpiece just behind the tangent point on the inside of the bend and prevent wrinkles, the wiper die would normally be "heeled out" about 2° to 5° off of true tangent (Fig. 1). It would not be quite parallel to the pressure die. This presents a taper entry for the workpiece, eliminating much friction along the length of the wiper die, but still offering necessary support near the tangent point where wrinkles begin to form.

Stainless steel presents a different problem. For stainless, the wiper die will normally be set in true alignment, parallel with the pressure die, with no heel angle. This is made necessary because of the column strength of stainless.

Instead of flowing into compression to make a thicker wall on the inside of a bend, stainless is tough enough to push itself back into the tangent behind the bend and form wrinkles at some distance behind the tangent point. Much more support is required.

This is provided by the full length of a wiper die set exactly parallel with the pressure die.

How To Set The Wiper Die

A suggestion for setting up the wiper die in proper alignment is to use a piece of solid bar stock ground to the same size as the workpiece to be bent. Clamp this master bar in place and run up the pressure die into position. *Do not rotate the bending die.*

With the setup bar in place, set the wiper die behind the bending form against the bar and bolt it down firmly.

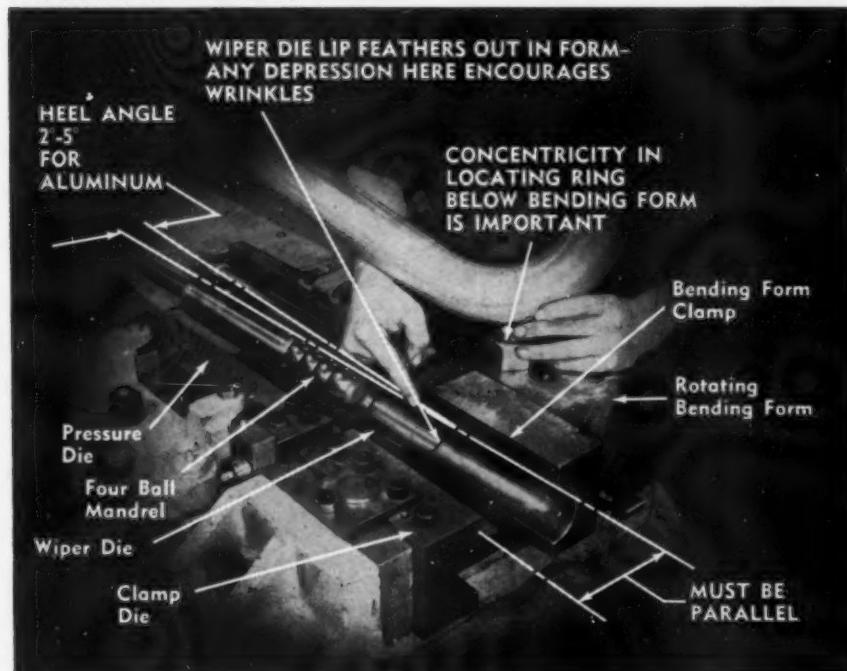
Now, unclamp the clamp and pressure die to remove the solid bar. This

setup should be *correct for stainless*. For softer materials, especially aluminum and some of the mild metals, the wiper die should be heeled over from 2° to 5° for the first test bend.

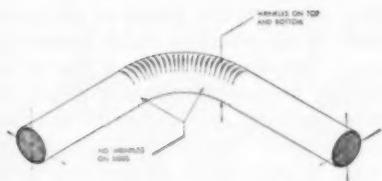
If wrinkles occur inside the bend area, increase the *pressure die pressure*. If no wrinkles occur inside the bend, but do occur along the wiper die just behind the tangent point, *reduce the heel angle* slightly less but not to zero. Adjustment should be made in increments of one degree or less until the wrinkles disappear and a smooth bend is obtained.

The heel angle should be *increased in proportion to the softness* of the workpiece material. This is to mini-

1—Complete set of tooling for typical tube bending opened up to identify each of the components discussed in this article.



Hand fit new wiper dies for wrinkle-free bends and to increase the life of the die



2—Wrinkles will appear on top and bottom sides of bend, not along inner and outer radii of bend, when excessive die tolerance occurs as a result of undersize tubing.

mize friction and avoid exceeding the ultimate tensile strength of the work-piece.

The harder the material, the more there is a tendency for the material to push itself back into wrinkles behind the tangent point when the bend is made. Therefore, the heel angle is reduced in proportion to the hardness and toughness of the material up to that of stainless which requires full pressure against a parallel wiper die.

It is desirable to heel over as much as possible to reduce friction, bending pressure, and the amount of power required.

Gap Between Lip And Tangent

In all positions of adjustment, it is desirable to have the lip of the wiper die come as close to the tangent point as possible. The lip cannot extend all the way because it cannot be feasibly feathered out to zero thickness. There will always be some gap (Fig. 7). This gap between wiper die lip and tangent point on the bending form is a troublesome factor. The gap appears right

where wrinkling begins. The larger the radius of the bending form, the bigger the gap. This explains why there is always a question of the best compromise between more support with greater friction vs. less friction and more likelihood of wrinkling.

Another factor enters the picture when you change the radius of a bend to be made. Mathematically, the gap between wiper die lip and tangent point of the bending form will increase as the radius becomes larger. In tooling up for a 2" tube bent to a 1" diameter radius (2" centerline radius), the minimum taper thickness of a wiper die would allow a relatively small gap of about $\frac{1}{8}$ ". But, in a set of tools for a 6" or 7" radius, the gap distance may be as much as $\frac{1}{2}$ ".

It is fortunate that as the gap distance must increase geometrically, the larger radius bend will have less tendency to wrinkle. The two factors are somewhat self-compensating.

But, this is assuming that the heel angle is not involved. As long as the heel angle is involved, and even on tight radius bends without a heel angle set on the wiper die, it is important to make the gap as small as possible.

What About The Gap Distance?

Hand fit new wiper dies for wrinkle-free bends and to increase the life of the die with a minimum of maintenance. Here's how:

Mount the bending form and pressure die on your machine as for bending. *Do not* mount the clamp die or its holder.

Coat the tube groove of the bending form with prussian blue from the tangent point back.

Clamp a master bar between the bending form and pressure die. A master bar can be made from a straight length of cold rolled steel, centerless ground to the O.D. of the work-piece with nominal tolerances of plus .000", minus .002". It should have a ground finish and be slightly longer than the combined length of clamp and pressure dies.

Rotate the swinging arm to 25° or 30° so the wiper die lip will not be fitted to the joint between the straight clamping insert and the curved portion of the bending die.

Place the wiper die against the master bar and slide it gently forward against the bending form. Tap lightly. Remove. Observe the blue marks on

the wiper die which indicate the contact points.

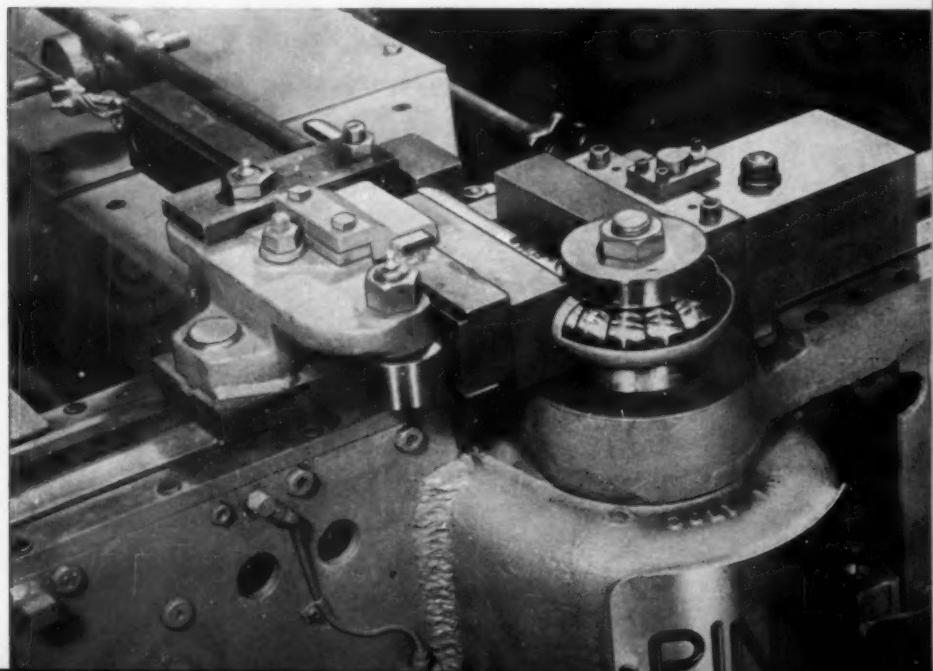
Rest the wiper die like a saddle on a piece of tubing to be bent, and hand grind off the high points. Repeat until at least 75% of the wiper die contact area shows blue from the bending form groove.

The job may take from 30 minutes to 8 hours according to size, machining accuracy, and skill of operator. But, once done, the feathered lip of the wiper die will come as close to the tangent point as would be possible. This is the only practical way to reduce the gap distance and, at the same time, get far better service from your tools.

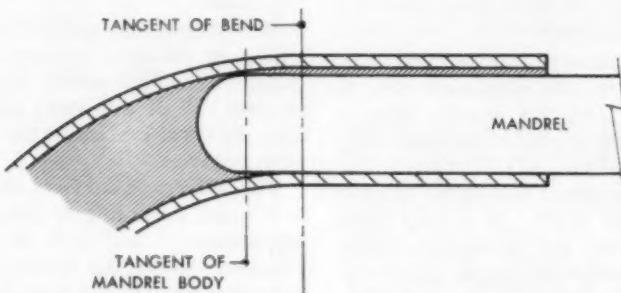
Variations In Commercial Tubes

But, let's assume that tooling is good and everything is in order for a given nominal size of stock tubing. Then,

3—Action of a ball mandrel can be seen here with part of tube wall cut away inside bend area.



WHAT DO YOU BEND? continued



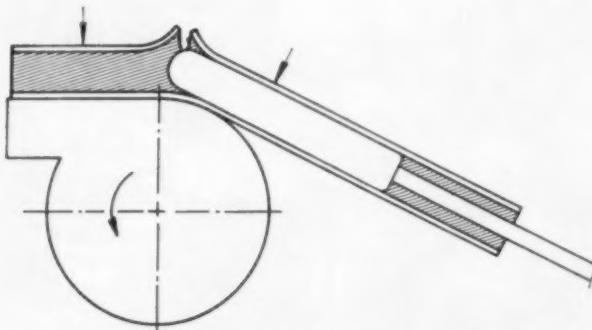
4—A slightly undersize plug mandrel is set beyond the bend tangent point to provide support to the inside of the tube. Tip setting is governed by sharpness of bend and clearance between mandrel body and inside diameter of tube.

you get a supply of tubing which, because of commercial tolerances, varies considerably from your nominal size. You may have too much interference, or there may be too much clearance between workpiece and tools. What are you supposed to do?

In the first place, with today's modern manufacturing techniques nearly all tubing is produced closer to

nominal diameter than stated in commercial tolerance specifications. Bending dies are made to fit the actual material to be bent, not the stated tolerances. One of your first actions on discovering your material varies considerably in size is to check your source of supply.

Even with close size control some slight variation will occur. In most



5—If plug mandrel is advanced too far, it will burst through the outer wall and fracture the tube as it bends. Arrows show pressure exerted by clamp die and pressure die, and direction of rotation on form die.

round tubing this slight difference is usually not enough to affect the quality of bends produced on a set of tools. In some instances, where material sizes tolerances are difficult to hold, as in square tubing, or where flattening and thinning must be rigidly controlled, manufacturers keep several different sizes of mandrels on hand. As a machine operator finds a work-piece over- or under-size he sets it aside rather than attempting to bend it. Later he installs the correct size mandrel and runs his off-size material with little trouble.

Some Make Allowance For Error

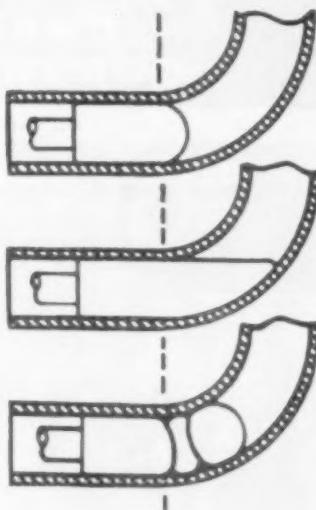
Close control of material sizes is an area of bending that has been overlooked in many plants. Instead these plants have written specifications with allowances for certain minimum wrinkling, flattening, and distortion. This questionable situation is not to be blamed on false economy or bad tooling. It is simply misunderstanding of the causes of imperfect bends in certain materials or certain machines with certain dies for certain radii.

Wrinkling, flattening, and distortion due to material variation are unnecessary and can be cured when you know the causes. When attempting to bend material that is less than nominal diameter the tolerance between the die and the work becomes more generous and wrinkles will tend to occur, not along the inner or outer walls of the bend, but along the sides. (Fig. 2). When a mandrel is in use this material will be difficult to load and will cause excessive mandrel wear. An undersize mandrel, well lubricated and correctly adjusted may enable production to continue while on-size mandrel is being procured.

Over-size material will tend to flatten, and the bending dies may even pinch distortion marks into the bends. If a mandrel is necessary one that is over-size, plus slightly less clamp and pressure die force, may enable continued production.

Tool Wear Introduces Problems

Bending problems may develop and lead one to suspect other sources of trouble when it is nothing more than normal tool wear. Rotating concentricity between the tube groove of the bending form and the machine spindle, as a good example, must be held within close tolerances (Fig. 1). A few thousandths eccentricity will re-



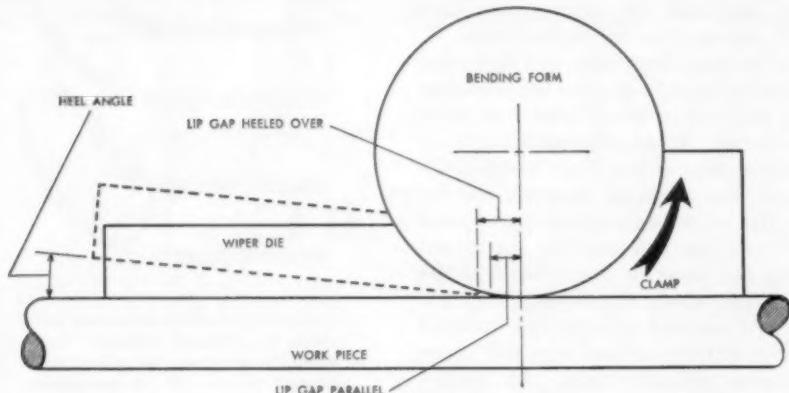
6—Normal depth of support provided by different standard mandrels. The plug mandrel offers least support to the I.D. of workpiece, ball mandrel the most. The form mandrel is desirable as a compromise between not enough support with a plug mandrel and the cost too high with a ball mandrel.



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WHAT DO YOU BEND? continued



7—There is always some gap between the tangent point and the lip of the wiper die because the edge of the lip can never feather out to zero. Lip gap increases with longer taper of feathered edge for larger radii bends, also when wiper die is heeled over for bending soft metals.

sult in obvious camming action as the form rotates. If this happens, the workpiece can either be squeezed out of shape or may slip, depending on whether the camming is toward or away from the pivot point.

This problem is of concern not only to those making their own set of tools, but to every production operator. As the bearing area wears on the bending form, such camming action can become a problem in perfectly made tools which are worked beyond normal wear capacity.

Protect Your Ball Mandrels

Expensive ball mandrels can become the victims of excessive die wear. When using ball mandrels to make close radius bends, proper alignment and mounting of rod supports and guides are important to prevent damage to both tubing and mandrels. (Fig. 3)

But, another important point to remember is that the clamp die and bending form grip the tube over the mandrel balls. This means that if the circular cross section of the tubing is deformed in the clamping area by worn or an incorrectly machined clamp surface, the tubing may bind on the mandrel balls.

Since the mandrel is held stationary while the tubing moves over the balls during the bend, excessive binding will cause broken tubing or a broken mandrel.

To determine if the clamp surfaces are worn or incorrectly machined, clamp in the machine a short piece of tubing which moves freely over the mandrel. Let the tubing extend about 1" in front of the dies. Slide the free mandrel into the tube from the front to determine if there is

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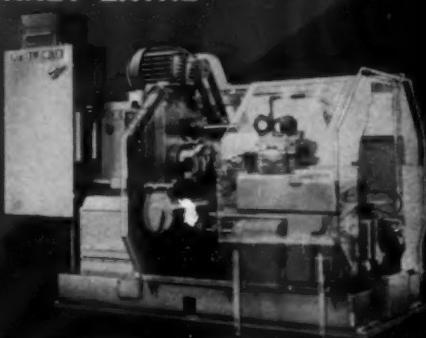


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WHAT DO YOU BEND? continued

enough clearance for the balls.

If the mandrel cannot be moved easily into the tube, there is deformation taking place and the balls will be locked into the tubing during a bend. This will cause wrinkles, tube breakage, or mandrel damage.

Make sure the grooves in the clamp die and bending form are large enough. And, you might try less clamp pressure to overcome the problem.

Must Be Correctly Adjusted

Basic tooling can be in excellent condition and still produce flattening problems if the mandrel is improperly adjusted or if the wrong mandrel is chosen for the bend. A systematic, though empirical approach, to this problem may expedite matters. Here

is the way it is done:

Check clamp die for slippage. During the bending cycle even a slight amount of slippage can cause wrinkling.

Check pressure die setting. If there is not enough pressure on this die, flattening and wrinkling may result.

Inspect the mandrel setting. If you are using a plug-type (Fig. 6) mandrel and excessive flattening still occurs, try resetting its position. Start with the tip of the mandrel at the tangent point of the bend. Make successive settings, advancing about $1/16"$ at a time after each test bend.

Advancement beyond the tangent point takes up the I.D. clearance provided for easy loading and adds more

support to the tube wall. (Fig. 4). If the mandrel is advanced too far, the tube will break, (Fig. 5), or the machine will stall. If a good bend cannot be obtained before breakage occurs and other adjustments are in order, switch to a form type mandrel which is made to fit the curve of the bend. (Fig. 6). This may give just enough more internal support to eliminate the problem. Fine increment adjustments of the form mandrel may also be required.

Thin Walls And Tight Radii

For thin wall tubing and tight radii bends, neither type of the above mandrels will give the necessary support. In this case, use a flexible ball mandrel which will extend deeply into the bend. (Fig. 6). But, before making the first test bend, check the

setting of the ball mandrel thoroughly to see that the balls will swing easily around the bending form, conforming to the die radius. If not, the linkage may be broken on the first test.

Lubrication Is Important

Frequent slide lubrication is necessary for good performance, too. Slide wear makes it impossible to maintain proper adjustment of tooling. Slides should be thoroughly lubricated at least once for every eight hours of operation. Regular lubrication not only provides a wear-resistant film, but also serves to flush out small abrasive metal particles which accumulate in ordinary operation. If your machine is equipped with an automatic lubricator, make sure the reservoir is kept full.

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WHAT DO YOU BEND? continued

drel is a major factor in successful bending. A lubricant should always be used when bending with a mandrel, particularly the flexible type mandrel. Lubrication will reduce mandrel galling, pickup and frictional drag between the moving tube and the stationary mandrel (Fig. 8). Clamp slippage, flattening of the bend, and tube breakage are reduced.

A lubricant also should be used when employing a wiper die. It reduces friction, wear on the die, and helps prevent scratches on the work. Whenever there is flat, sliding contact between the material being formed and a die or material guide, apply lubricant at this point.

Lubricants can be applied inside a

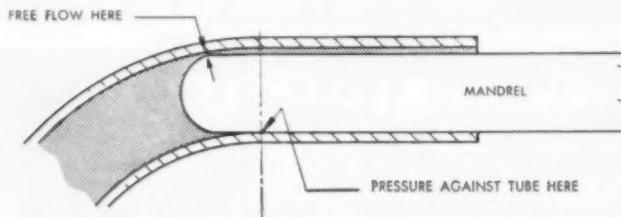
tube by dipping, swabbing, or spraying. This depends on the material length, diameter and other job conditions. In some cases where a relatively light, non-evaporating lubricant such as light oil can be used, a mandrel rod lubricator can be used. External lubricant can be applied to the workpiece or dies with a swab.

Keep Clamps Clean

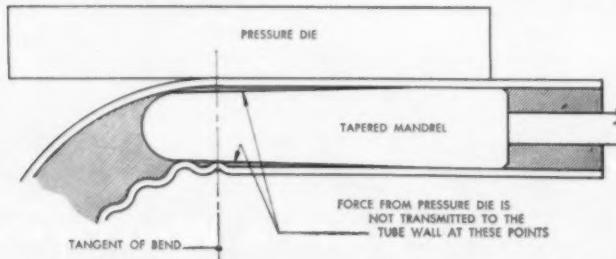
Never allow the lubricant to penetrate into the clamping areas. This error will cause slippage and resulting rejects.

What Kind Of Lubricant?

The type of lubricant will vary with material and job. For aluminum, a



8—Dimensions of this drawing are exaggerated to show that clearance between mandrel and I.D. of tube must be sufficient to permit free metal flow over the mandrel. Lubricant is important at this point for successful, good quality bends and to protect tooling.



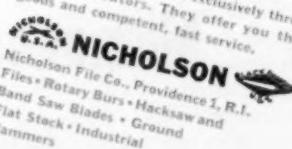
9—Here's an obvious error which can result in wrinkles if mandrel is tapered through poor machining or wear.



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MANDREL SELECTION CHART

Tube Dia.	WALL THICKNESS													
	.016	.020	.025	.028	.035	.042	.049	.058	.065	.072	.078	.083	.095	.109
F indicates form mandrel												Figures indicate number of balls		
5/8"	1	1	1	1	1	1	F	F	F	—	—	—	—	—
3/4"	1	1	1	1	1	1	1	1	1	—	—	—	—	—
7/8"	1	1	1	1	1	1	1	1	1	—	—	—	—	—
1"	2	2	2	2	2	2	2	2	2	—	—	—	—	—
1 1/2"	3	3	2	2	2	2	2	2	2	2	2	2	2	2
1 1/2"	3	3	2	2	2	2	2	2	2	2	2	2	2	2
1 1/2"	4	4	3	3	3	3	3	3	3	2	2	2	2	2
2"	4	4	3	3	3	3	3	3	3	2	2	2	2	2
2 1/2"	4	4	4	4	4	3	3	3	3	2	2	2	2	2
2 1/2"	4	4	4	4	4	3	3	3	3	2	2	2	2	2
3"	4	4	4	4	4	3	3	3	3	2	2	2	2	2
3 1/2"	5	5	5	5	5	4	4	4	3	2	2	2	2	2
4"	5	5	5	5	5	4	4	4	3	2	2	2	2	2
4 1/2"	6	6	5	5	5	4	4	4	3	3	3	3	3	3
5"	6	6	6	6	5	5	5	5	4	4	4	4	3	3
5 1/2"	6	6	6	6	6	5	5	5	4	4	4	4	3	3
6"	6	6	6	6	6	6	5	5	4	4	4	4	3	3

Use this chart to select the proper mandrel to make good quality bends of 2-diameter radii up to 90°. As a general rule, for 1 1/2-diameter bends up to 90° or 2-diameter bends up to 180°, jump from form mandrel to one ball, or add one ball to number given in chart. For the white area in the bottom left corner, add two balls. But, for the white area in the upper right, no additional balls are necessary. CABLE MANDREL—use twice the number of balls indicated by this chart because cable mandrel balls are nested closer together.

heavy compound or a heavy oil is frequently used. But, with steel, a drawing compound or a lighter grade of oil is desirable. All the standard machine shop lubricants may be candidates for the job, in addition to soap and wax. In any case, the point to remember is that with sliding contact, the proper lubricant can make the difference between a successful bend and no bend at all.

An automatic lubricator system is a great advantage in operating with light oils or other light viscosity non-evaporating type lubricants. But, it is not good for soaps, water solubles, or lubricants which can evaporate and build up or clog the system.

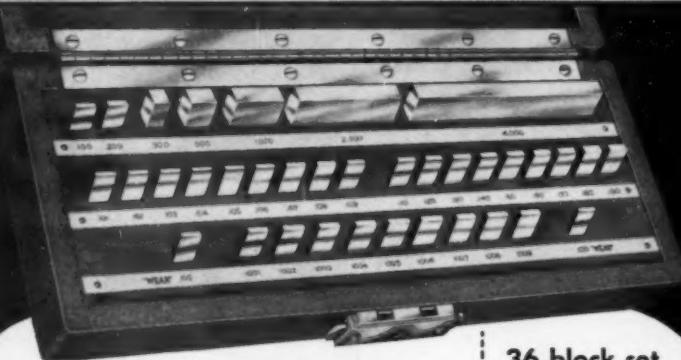
Even with proper tooling, good ad-

justments, adequate lubrication and any other desirable factors, there are still problems which occur in cases of material too hard for a required bend. If tubing is too hard, the most likely evidence will be breakage in spite of everything else established according to Hoyle.

Too Hard To Bend?

A good indication of an approach to tubing too hard for a given bend is that first, wrinkles will be unavoidable. And, as pressure die pressure is increased to eliminate the wrinkles, there is a point at which the operator makes successive adjustments until he is quite certain that on the next bend the wrinkles will be gone. On that bend, the tube will fracture. You very

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WHAT DO YOU BEND? continued

possibly have material that is too hard.

Spot Annealing Sometimes Helps

If the material is too hard, it may be entirely impossible to make the bend without changing the properties of the material. One solution would be to spot anneal a section of the material and test bend that. If the bend can be made after annealing but not before, you have a possible answer on the question of excessive hardness.

While spot annealing tends to prove the case, it will not necessarily solve the bending problem. It introduces new problems in the form of scaling on the inside of the tube. Such scaling may or may not permit movement of the workpiece over the mandrel.

A generous application of lubricant on the mandrel will help if the tolerance between mandrel and workpiece allows for the film thickness. (Fig. 8).

If the part cannot be bent then, the next step is to consider using the next milder grade for the sharpness of bend being attempted. Before ordering new material it's a good idea to consult the bending machine manufacturer for his experience in similar cases.

Selecting The Correct Tooling

The discussion of all problems in this article is based on the premise that you are working with the right machine and proper tooling. Tooling to suit your requirements can be obtained from the machine manufacturer in many cases cheaper than you can make your own—if you allow for troublesome problems and the time it will take to gain their experience. Purchased tooling comes tested and

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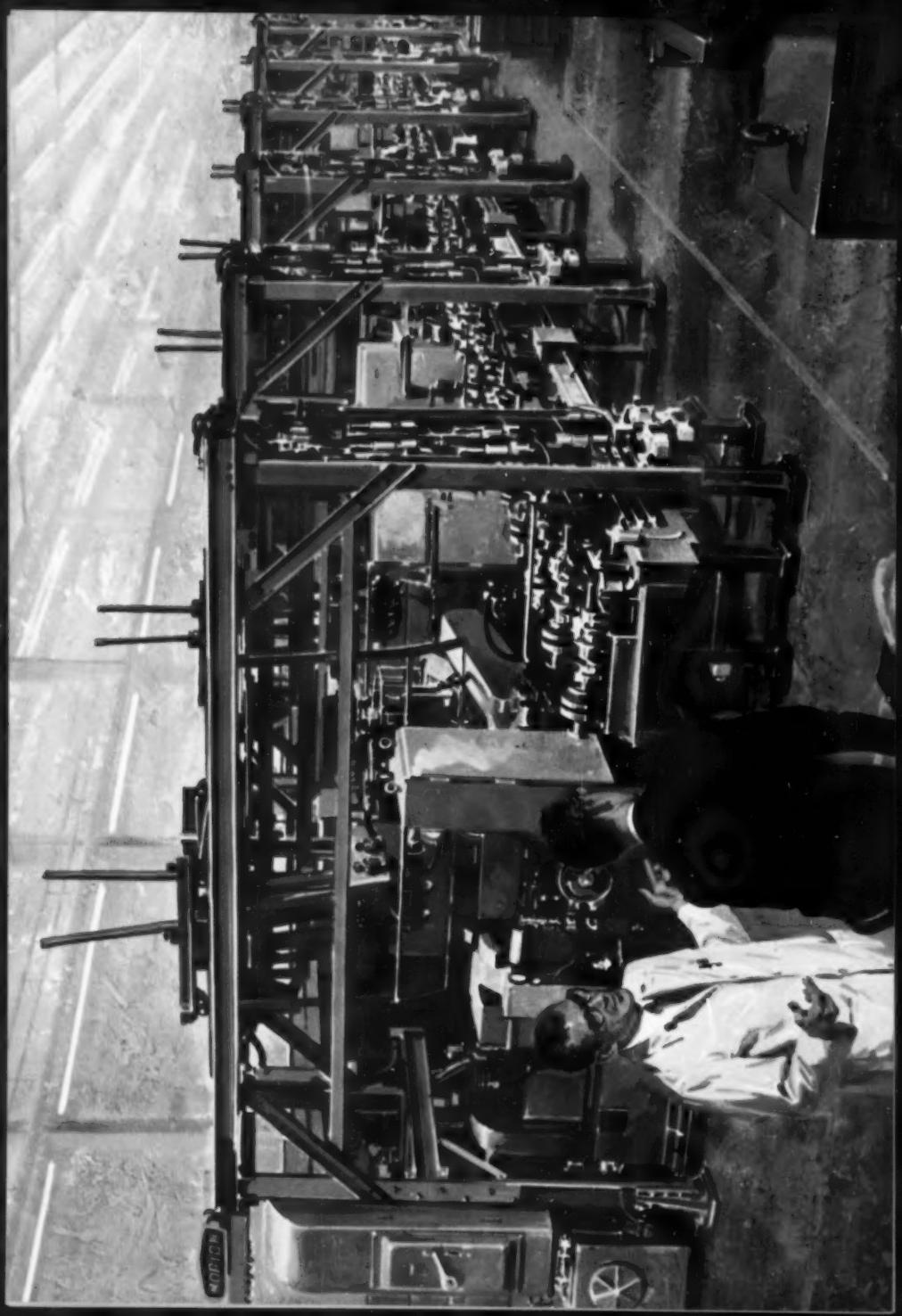
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ready for operation. But, the machine builder or tool supplier cannot serve you efficiently without adequate information about what you plan to do and how you are going about it.

To obtain a reliable tool quotation, you must supply the manufacturer at least the following information:

1. Specific material to be bent.
2. Round tube diameter or cross section dimensions of other than tubular workpieces.
3. Wall thickness if uniform, or all thicknesses of each section in extruded parts.
4. Bend radius to the centerline of round tubing, or bend radius to face lines of other shapes.
5. Maximum included angle of the bend from tangent to tangent.
6. Tangent distance between bends if more than one bend is to be made in the workpiece.
7. Name and serial number of your bending machine.

This is the least information you should supply before you can expect prompt cooperation and satisfaction. In addition to the above items, however, you should also, naturally, send a print of the job, giving all specifications. If not, next best will be a sample bent part. It is also a good idea to include the name of the part or product and the production desired.

What can you bend on a bender? The approach may not be direct and it may take a little time to achieve success, but the answer is: anything which can be made to flow under stress if you have the right machine and tools.

* * *

June, 1960

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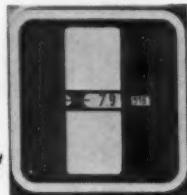
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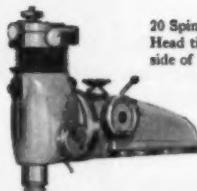


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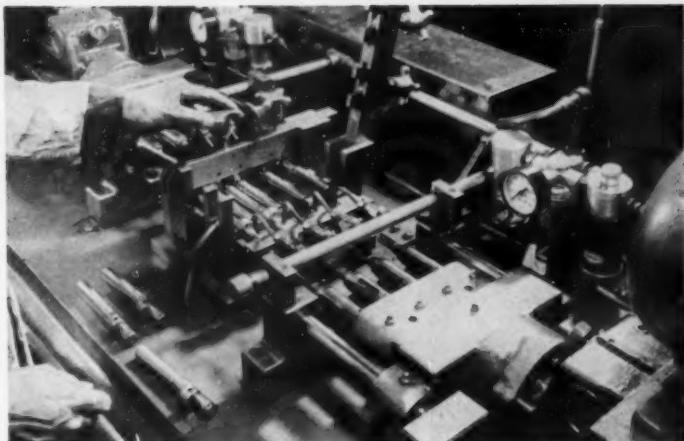
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MACHINE and TOOL BLUE BOOK

field reports

II



Simplicity is noteworthy in this fixturing of crankshafts for drilling $\frac{1}{8}$ " diameter oil holes. Operator unloads and loads while other power unit drills fixtured parts. Holes are peck drilled in three passes.

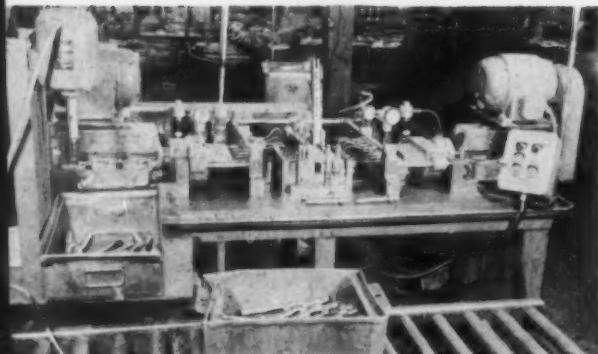
IMPROVED FIXTURING PLUS POWER UNITS EASE STRAIN ON MACHINES AND OPERATOR

■A routine "improvement" check into production methods at the plant of a manufacturer of compressors and compressor parts revealed that their method of deep-hole drilling a compressor crankshaft casting was straining both men and machines.

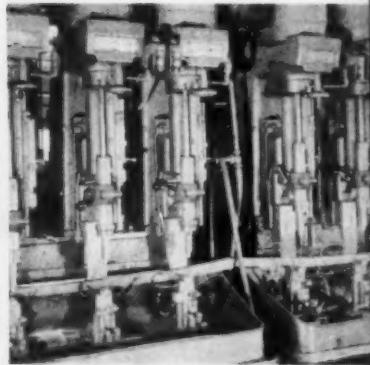
The operation consisted of drilling a $\frac{1}{8}$ " diameter hole, 2-10/32" deep in one end of a pearlic iron crankshaft. The part was being drilled on one of two four-spindle vertical drill presses. Each spindle had a separate hand loaded fixture; each operator had to traverse the length of his table, loading and unloading fixtures in sequence.

Although this method was adequate when first adopted, rising production demands soon made it apparent that quality standards and production schedules could not both be maintained.

An alternate method was developed in cooperation with the Drillimation Company of Center Line, Michigan. The resultant



AFTER: One machine using one fixture enables one operator to stay put. Note saving in floor space and handy location of conveyor system.



BEFORE: Eight of these vertical drill presses, each equipped with a separate hand loaded fixture, kept two men busy serving each spindle on the line.

When men and machines strain, quality suffers

FIXTURING PLUS POWER UNITS continued

machine is called "Double-End Deep-Hole Drilling Machine." Nucleus of the machine is two Model 500 power units, each equipped with a four-spindle, flange-mounted drill head equipped with a deep hole attachment.

Fixturing is compact. A hand loaded fixture holds eight workpieces; the operator unloads and loads four workpieces at one end while the power unit at the other end is cycling.

Savings were apparent from the very first as one operator now has the same production capacity two operators previously had. The power units are also run at much slower speeds than the drill presses were run. Where the drill presses ran at 110 sfpm, at

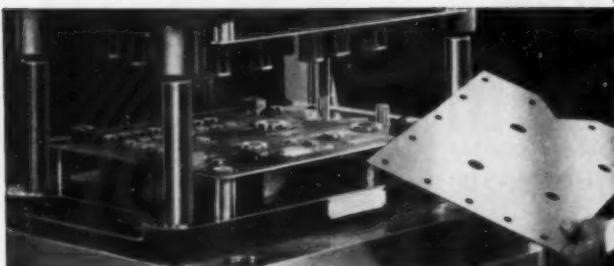
3600 rpm and at 5.4" per minute feed, the power units performed the same operations at 45 sfpm, at 1800 rpm and 4.55" per minute feed (.0028 ipr).

The slower speeds eliminate the former failure of bearings and of pump failures. Tool life is extended two or three times, according to plant personnel.

An added inducement towards special machines of this nature—the company realizes a 50 per cent saving in floor space and also a reduction in material handling. A gravity conveyor now carries all parts to and from the machine.

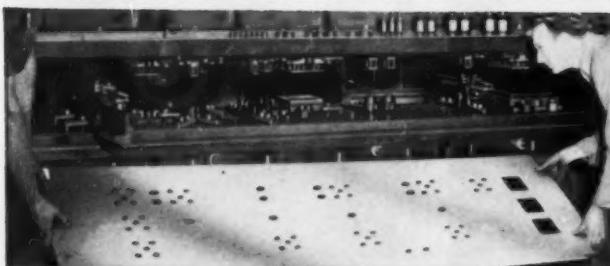
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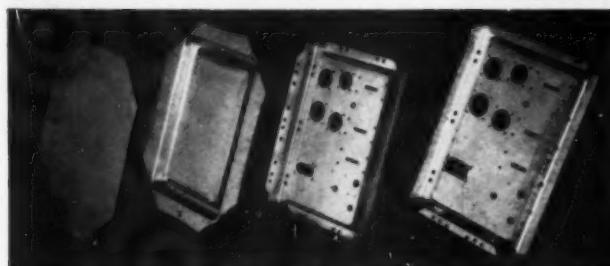
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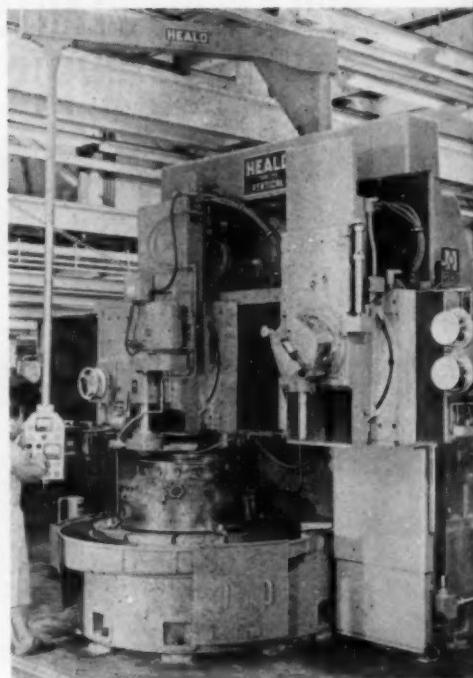
SOUTH SAN FRANCISCO—United Air Lines is revolutionizing jet engine overhaul at its new maintenance base here. The job is being done with a new type of vertical machine capable of a variety of grinding, boring, facing, turning and associated operations.

Big enough to handle such large parts as turbine engine diffuser cases, the Heald 578 vertical can accommodate work up to 52 inches in diameter and 48 inches high. It is versatile enough for such jobs as: grinding tips of rotor blades; turning IDs and shoulders of aluminum rings in stator blades; turning and grinding stainless steel diffuser case joints; grinding bearing seats on shafts and in rotor shaft bores; toolroom jobs such as grinding the planimeter rings for checking the shape of sheet metal sound suppressors, the holding fixtures used on the machine, and the tips of bushings in a ring jig for locating 80 ventilation holes inside the diffuser casting.

Jet Age Maintenance

For United, the 578 represents an answer to problems inherent in jet "remanufacture," which differ sharply from overhaul practices encountered in piston engines.

Size of the components alone calls for flexible equipment capable of handling a variety of operations with minimum set-ups. Commercial overhaul plants can't base their operations methods on military experience or on



New Heald vertical machine installed at United Air Lines' jet engine overhaul base is capable of a variety of grinding, boring, facing, turning and associated operations.

original engine manufacture because conditions just aren't the same. Jet parts require a big machine (the 578 is 15 feet high, 15 feet wide and 12 feet deep) with great swing and travel, rigidity to handle big components but with a light touch for smaller aircraft parts. Flexibility for machining several types of metal on the same equipment demands greater versatility in speeds, feeds and controls.

Machining Sequence

When the Pratt & Whitney engines which power the United's DC-8 Jet Mainliners enter the turbine overhaul

and test section they are stripped to individual components for preliminary cleaning. After inspection, the stainless steel cases move to the Heald vertical for boring and turning operations.

Chrome plating levels the worn and pitted areas, after which finish grinding (at up to 6000 surface feet per minute) restores the part to dimension within a required tolerance of 0.0003" and 15 RMS finish.

Diffuser cases are held with four chuck jaws on the table. Rotor and stator rings are clamped on the table with hold-down clamps between sheets of $\frac{1}{4}$ " thick rubber centered on a steel stud to prevent distortion during grinding. Carbide tools are held in the turret by ram type holders, and when coolant is used, it circulates at 20 gallons per minute at 30 psi.

"Universal" Machine

The ten-ton slide assembly of the 25-ton vertical incorporates both a grinding head and a metal cutting turret. The five-position turret cut-



Grinding big stainless steel turbine diffuser case. The vertical machine is remotely controlled from a pendant while the machine is operating.

June, 1960

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FIELD REPORTS continued

ting compound, used primarily for roughing, holds five single-point tools for boring, facing, turning and associated operations. The grinding head is used for finishing operations and is capable of internal, face, external and rotary surface grinding.

Unique Control System Used

The machine's control system is unique in that speeds are controlled hydraulically from a remote position by electrically actuated throttles. Electro-hydraulic reversal of the grinding slide is effected without mechanical linkages by transistorized proximity limit controls developed by the tool builder. This system avoids the necessity for a mechanical linkage from the dogs to reverse valves high up on the slide, which would have

made the slide assembly large and cumbersome. Direct current actuated valves of Heald design are utilized for compact size and speedy operation.

The transistorized control also serves to soften reversal strokes electrically to prevent inducing shocks into the machine structure which would affect finish. A remote control dwell at either end of the grinding stroke allows bringing slowly rotating large diameter work to size without secondary grinding. Tarry or dwell of 1/3 to 20 seconds at top and bottom can also be set independently.

A barrel stop on the cutting slide is geared to the turret for a feed depth control. When the turret indexes, the barrel also indexes so each tool in the compound stops at the same hole depth regardless of tool length.

• • •

NEW MAUSER VERNIER CALIPER

**STAINLESS STEEL HARDENED THROUGHOUT
FULLY LUSTRO-CRHOE SCALE AND VERNIER**

**For Outside, Inside and Depth
6-1/4" Measuring Capacity**

Reading Lower Scale — .001"
Reading Upper Scale — .001"

\$19 75

New flush type Vernier eliminates reading parallax

Double length vernier for more accurate and faster readings

Fine Cam-lock adjustment for easy setting at close limits

Overall length 8-1/8"

Cat. No. 193 furnished in clear unbreakable polyethylene case

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When writing to any of the above locations, refer to Det. B-8

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PRECISION MEASURING TOOLS AND INSTRUMENTS



***So what's all the commotion
about this R-O Universal Form
relieving Fixture and Grinder?***

***So we've been sharpening tools
for 30 years without problems—
Why change?***

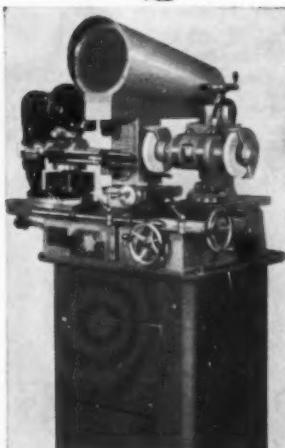


***So it makes a cheap cutter last a
little longer—Probably costs
a lot more than it saves!***

***So it makes a tool cut a little cleaner
—We don't have quality problems—
We're satisfied with our speeds!***



***So I should spend a lot of money
when I'm getting by OK?***



Keep talking, mister—your doubts ring a familiar note! But can you hold close step limits. Can you check your tools without disturbing set-up, etc. Get all the facts. Your appraisal may not be fair to yourself. Some of the most enthusiastic users of R-O equipment were doubters first.

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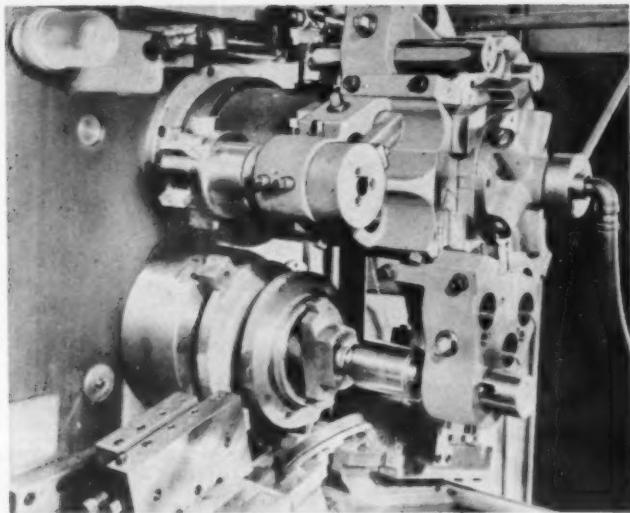


MOLYKOTE G LUBRICANT

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shop hints and kinks

12



Seat ring driver used on Warner & Swasey 2-AC chucking automatic to handle an assembly operation during automatic machining of regulator valves at Minneapolis-Honeywell Regulator Co.'s valve division, Fort Washington, Pa.

COMBINED OPERATIONS INCREASE VALVE PRODUCTION AND QUALITY

■ Combining of an assembly operation with an automatic machining cycle is the technique used by Minneapolis-Honeywell Regulator Co. to increase production and quality of precision regulating valves for heating and air conditioning equipment applications. The units are produced at the company's Valve Division, Fort Washington, Pennsylvania.

A Warner & Swasey 2-AC single spindle chucking automatic, equipped with a three-jaw air chuck, handles all required machining on each cast iron valve tailpiece, using only three of the machine's five available turret stations. This work includes tapping of a $6\frac{5}{8}''$ -10 pitch thread.

A cycle stop pin inserted in the 2-AC index control

SHOP HINTS continued

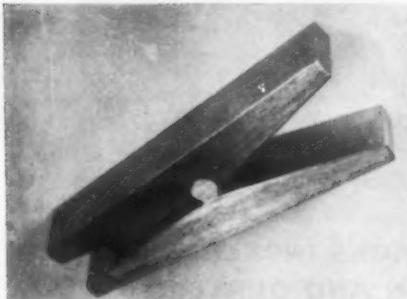
drum stops the automatic cycle between turret station No. 3 and No. 4 to permit a 6" dia. bronze seat ring to be started by hand. Pressing the cycle start button then returns the machine to automatic operation, with station No. 4 automatically driving the seat ring home, and station No. 5 finish boring to a .003 total tolerance and forming the 60° valve seat in the bronze insert.

The seat ring driver (see photo) consists of a standard friction tap chuck with a special spring loaded drive plate. As the turret feeds toward the chuck, two ears on the drive plate engage driving lugs on the seat

ring. The spring action of the drive plate permits slight longitudinal movement and eliminates possible damage to the turret drive mechanism as it feeds forward to its positive stop. Feed rate is equal to the 10-pitch thread on the seat ring or .100" per revolution. Spindle speed for this driving operation is 292 rpm.

Machining the work piece, inserting the seat ring, and finish machining the ring—all in one chucking—not only speeds production, but assures precision concentricities, according to Minneapolis-Honeywell engineers.

• • •



PIVOTING PARALLEL HOLDS TAPER WORK IN VISE

By H. J. Gerber

■ Flat, tapered work can be held securely in vises of milling machines, drill presses, etc. by use of this two piece pivoting parallel which adjusts itself to small angles up to about 20°.

The parallel is made in two parts keyed together with an integral round key. This one is made by bandsawing the male keyed part and finishing the contour of the key on a die maker's

filming machine. The key seat in the female half was drilled before the contour was sawed. Another method for producing the key on the male half would be to braze a dowel pin to the contour sawed piece.

This simple shop-made accessory has paid for itself many times over on the "tough to hold" jobs like the one illustrated.

• • •

MORSE MAKES MILLIONS FOR PHILCO



...millions of tiny holes—precision-drilled by rugged, long-life Morse "Electrolized" Tools for Philco's fabulous Transac.

It's the world's first large-scale all-transistor computer—Philco's new Transac S-2000. Among its components: 18,000 printed circuit cards of epoxy resin glass fiber—highly abrasive, excessively wearing on the tools that have to drill hundreds of tight-tolerance holes in each card.

Philco uses the tools that are armored for rugged action: Morse "Electrolized" drills. More durable than high speed steel... more flexible than carbide... savers on down-time, replacement.

Morse will help you, too. Tell your cutting tool problem to your Morse-Franchised Distributor. He's the man with the answers.

MORSE

means "THE MOST" in Cutting Tools

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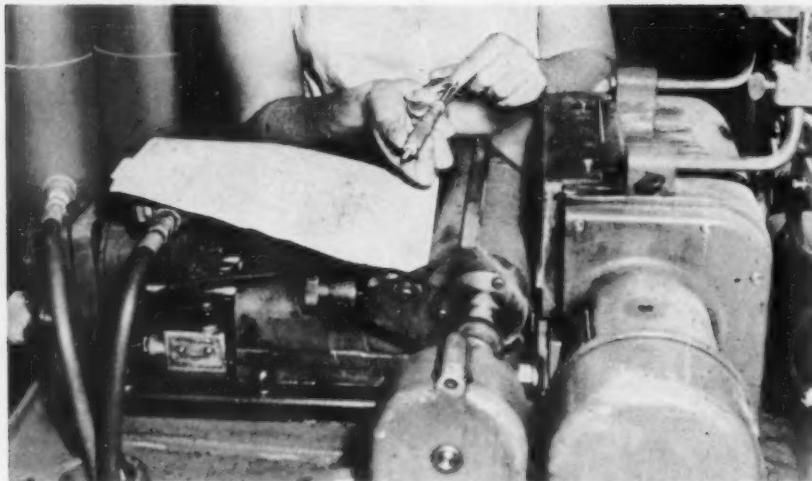


Morse means more production... smoother, more accurate production... with every type of cutting tool from drills, reamers, taps and dies, to end mills, milling cutters, slitting saws and "specials". So, if you want the best from every cutting tool you buy, mark your order "MORSE". For if you want Morse Quality, there's only one way to get it... specify Morse.



A Division of VAN NORMAN INDUSTRIES, INC.

SHOP HINTS continued



WITH A SETUP LIKE THIS crush form grinder, small cylindrical parts can be formed from laminated plastic or vulcanized fibre stock to finish tolerances as close as $\pm .0005"$ or tighter. Equipment is a specialized form of centerless grinder which can form any part produced on a lathe.

CRUSH GRINDING OFTEN BEST METHOD TO FORM SMALL CYLINDRICAL PARTS

■ When forming small cylindrical parts from laminated plastic or vulcanized fibre, particularly in large quantities or to extremely tight tolerances, Taylor Fibre Co., Norristown, Pa., suggests that crush form grinding be considered.

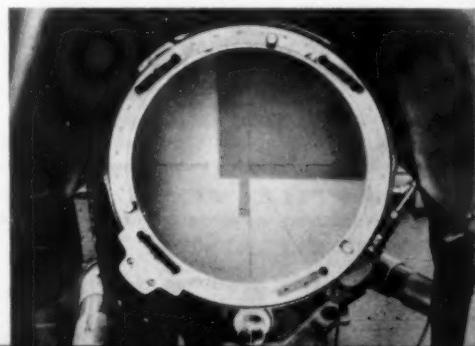
This adaptation of conventional centerless grinding not only does the job as much as 20 per cent faster than screw machine or lathe production but also, in many instances, makes the difference between meeting or not meeting tolerance requirements. Leaving no burrs, it thus eliminates a separate operation.

Capable of producing any part which can be produced on a lathe with forming tools, crush grinding is

recommended where:

- Finish tolerances must be held to $\pm .0005$ inch or tighter (normal screw machine or lathe tolerance is $\pm .002$ inch).
- The parts are required in large

YOU GET PARTS LIKE THIS. Shown in the profilometer used to check tolerances of $.0005"$ is a firing pin, which could not have been produced to tolerance requirements by other methods. Pin is $.225"$ long, $.064"$ in width, and has a 15° taper to $.020"$ depth at ends.



enough quantities—generally 300,000 and upwards—to justify initial cost of wheels.

- Lathe bits might cause de-lamination of the laminated plastic.

A multiple series of grooves, bevels, or other configurations are cut into the work wheel surface for the specific part being formed. As many as 25 or 30 small parts can be made at a time from a single piece of feed stock, at rates of up to five or six cycles per minute. Wheels are capable of long runs with little wear, depending upon the material being worked.

The work wheel and the backup wheel both support the work, minimizing the breakage which is sometimes suffered with lathes or screw machines, particularly when forming long, thin pieces.

A recent case illustrates the value of the technique. In this instance, the part required was a firing pin, only .225 inch in length, .064 inch in width, and with tolerance of $\pm .0005$ inch, with no burrs permitted. Requiring a 15 degree taper at either end, to .020 inch depth, this simply could not have been made by other production methods and still have met required tolerances.

• • •

... OR LIKE THESE. These laminated plastic parts are among those which Taylor has produced by the crush form grinding technique. Parts shown are small reels, bobbins, rivets, shafts and pins for a wide number of applications. Parts up to 8" in length and to 1½" in diameter can be formed by this method.



A Specialized Tap Extracting Tool that will stop small Cost Leaks In Metalworking

How much labor and production time do you waste removing broken taps? How many expensive parts are damaged or scrapped? Much of this time, and the parts, can be salvaged with Walton Tap Extractors.



No annealing or drilling. The broken tap is removed without delay ... and without damaging the threads. Furnished for 2, 3, 4, 5, 6 flute styles, in sizes No. 4 to 1½". Try them at our expense (free trial) in your shop.

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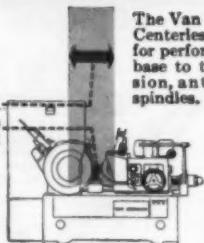
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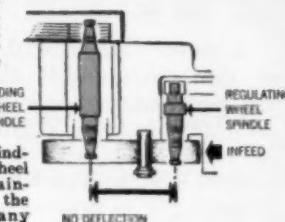
All industry is talking about the new Van Norman



NO DEFLECTION
HERE MEANS...
MAINTAINED
TOLERANCES HERE



The Van Norman Diversimatic Centerless Grinder is engineered for performance from mounting base to the heavy duty, precision, anti-friction unit type spindles.



The anti-friction grinding and regulator wheel spindles assure maintained precision in the workpiece under any condition.

BENDIX CORPORATION BOOSTS SYNCRO

VN Centerless Grinding cuts production operations,

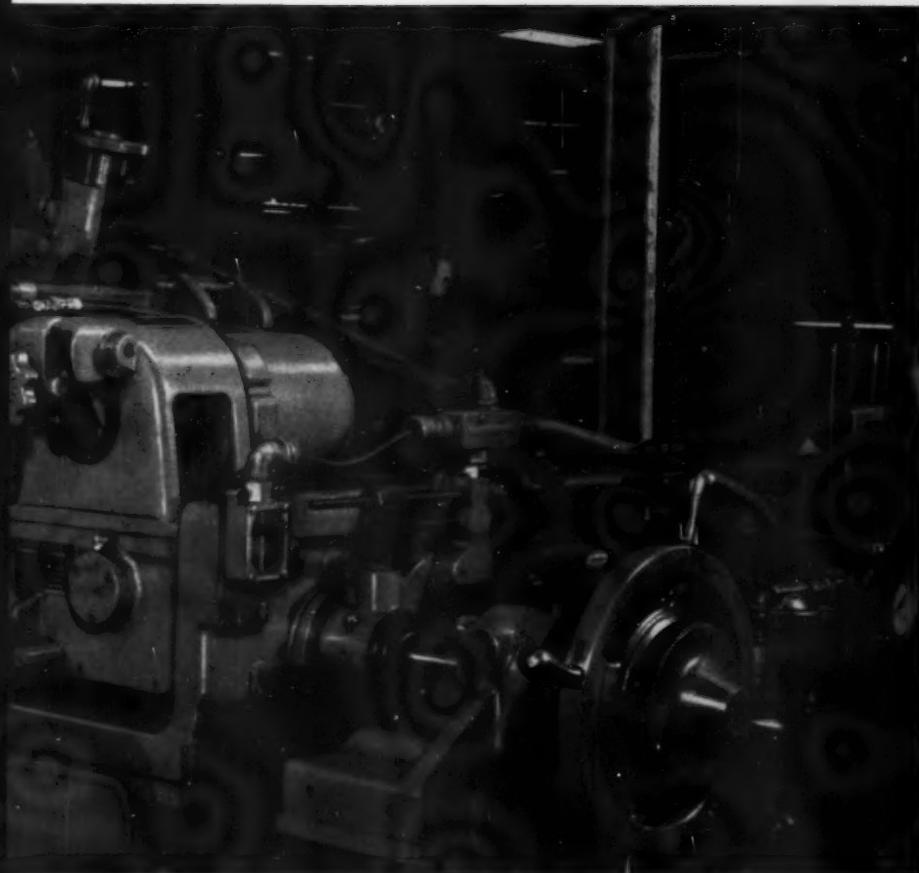
Bendix boosted hourly production of Autosyn syncro shafts to 600 per operator with a Van Norman Centerless Grinder. One Van Norman Centerless Grinder (with a specially developed automatic feed) replaced two manually fed machines, which produced only 50 shafts per hour.

Annual Savings \$9,000—eliminating the need for highly-skilled burnishing operators—100% inspection was eliminated. Concentricity control and improved tolerances were obtained with the Van Norman Centerless Grinder.

Faster Set-Ups . . . Increased Production . . .

VAN NORMAN

SPRINGFIELD 7, MASSACHUSETTS



SHAFT PRODUCTION 1200%

inspection time and material costs — saves \$9,000 annually

Greater Accuracy. The Van Norman Centerless Grinder is specifically engineered to produce more precision grinding per operator per work shift...designed for in-feed work, thru-feed work, crush form grinding and profile work. The Van Norman Centerless Grinder is rugged, and design-

ed for heavy duty, long run production. **Send For Free Booklet**—“Centerless Grinding,” your local VN Franchised Distributor will be happy to discuss how VN Centerless Grinding may increase production and cut costs for you . . . call him NOW!

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Speed your forming and fabricating



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BRAKES



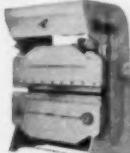
11 Hand Operated Models



1 Hand Operated Model



3-12 Ton Models



2-25 Ton Models

ROD PARTERS



2 Hand Operated Models

1 Power Model

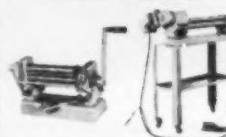


5 Hand Operated Models



2 Power Models

ROLLERS



8 Hand Operated Models

6 Power Models



5 Hand Operated Shears

1 Hand Operated Notcher



4 Power Shears



1 Power Notcher

SPRING WINDER



1 Hand Operated Model



2 Hand Operated Models



2 Power Models



1 Turret Model

PUNCH PRESSES



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MACHINE and TOOL BLUE BOOK

free literature

To receive copies of booklets described below, circle their identifying numbers on an Action Card, found opposite pages 96 and 224.

13



(See Number 1)



(See Number 2)



(See Number 3)

1. Precision Measurement. Micro-Line is a new photographic imaging technique in the field of super fine precision measurement. It is stated the process has made possible photo reductions of a million or more diameters without distortion. Scale has 1,000 lines to the inch with an accuracy reported to .0001". The vernier situated in the eyepiece of the microscope gives direct reading to one ten-thousandths of an inch. Literature is issued by Micro-Line Inc., Jamestown, N.Y.

2. "Pressure Forming Internal Threads With Tru-Lede Fluteless Taps" is the title of a brochure on this tap, which is actually a forming tool, whose action may be compared with external thread rolling. The technique involves displacement of metal without removing it. Standard sizes and net prices, recommended drill sizes for the taps, tap and product pitch diameter limits, etc. are included. Greenfield Tap & Die, Greenfield, Mass.

3. Milling, Drilling and Boring Machine. 16-page bulletin No. AP-60 entitled "Around A Part in Just 8 Days" describes in pictures the actual story of how a typical Milwaukee-Matic job was processed from print to finish-machined part in only eight working days. It compares conventional manufacturing methods with the Milwaukee-Matic system. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

4. Self-Leveling Work Positioners. Photographs show clearly how the top layer of material on the Lowerator work positioner is kept always at the ideal working/dispensing level, whether the unit is completely filled, half-full or nearly empty. Recommended uses, dimensions, and weight capacities are included for all types and models. Lowerator Division, American Machine & Foundry Co., AMF Bldg., 261 Madison Ave., New York 16, N.Y.

5. Cross-Slide Rotary Table. Bulletin gives complete details and description showing the many uses, the design, construction features, etc., and the variety of actual jobs which can be made by using this unit. Once the work is located and clamped on the top cross-slide, it is rarely necessary to move or reclamp until all cuts are completed. Advance Prod. Corp., N. Shore Dr., Benton Harbor, Mich.

6. Turret Drilling Machine. The bench model Burgmaster machine has its own built-in power-indexing mechanism with safety clutch. Folder also states that operator can center drill, drill and tap in orderly sequence. Each spindle operates at its own speed for machining with all tool diameters up to $\frac{1}{4}$ ", 350 to 6200 rpm, 12 speeds (2 for each spindle). Burgmaster Corp., Box 311, Gardena, Calif.

FREE LITERATURE continued

7. Milling Machines. Illustrations, descriptive material and technical data are provided in brochure on the Bohle knee type, cycle, bed type, copying and production milling machines, as well as special machine tools. Reinhard Bohle Machine Tools Inc., 2190 E. 40th Ave., Denver 5.

8. Stamp Holders. Hercules gang stamp holders, with quick release, permit instant interchanging of letters and figures. Sizes range from four piece holders to ten piece holders. Price list is included with literature available from the Acromark Co., 15 Morrell St., Elizabeth 4, N.J.

9. Cutting Fluid. 27-page catalog includes six types of Trim offered for the particular job, with ten steps to better machine production, and a selection chart. Product is water-based, but uses chemical for lubricating properties (rather than oil—often inflammable). Master Chemical Corp., 13 N. Huron St., Toledo 1.

10. Air Stakers. Brochure illustrates various models to meet numerous production requirements with a wide selection of interchangeable tooling. Basically an arbor press with a staking feature, it performs pressing or staking operations independently or combines them in rapid sequence. Assembles small components such as cams, bushings, gears, etc. Cramer Controls Corp., Centerbrook, Conn.

11. Power Saws. A 12-page color catalog describes and illustrates a new line of power saws. Included are Models C-67

and C-68 for straight cut-off work and Models C-167A and C-168A for mitering and angular, as well as straight, cut-off work. Featured is the Speedmaster variable drive which makes it possible to change tool speed instantly within range 60 to 350 fpm. DoAll Co., Des Plaines, Ill.

12. Jig Boring Machine. The Atlantic Model 5000 jig borer locates holes with accuracy of one ten-thousandths of an inch and bores holes within limits of .0002". Infinitely variable dial controlled, the machine has low range, 45 to 275 rpm, and high, 275 to 1980 rpm. Further details and specifications are covered in bulletin from Atlantic Machine Tool Works, Inc., 549 Cedar St., Newington, Conn.

13. Automatic Bar Feed automates the feeding of bar stock for practically any lathe. The E-Z-Air holds and feeds bar stock diameters of 1" and smaller. Three tube sizes are offered to accommodate 3', 4' and 6' stock. Holdridge Mfg. Co., 5828 Santa Fe Ave., Los Angeles 58, Calif.

14. Cut-Off Machines. The Model MF and Model MH-A automatic metal cut-off machines are described, with specifications, in flyer offered by Comet Mfg. Co., 2033 Santa Fe Ave., Los Angeles 21, Calif.

15. Name Plate Stamping Machine. The Acromarker stamps nameplates, parts, tags, tickets, etc. Literature discusses special types for special jobs, special fixtures, and various models. The Acromark Co., 15 Morrell St., Elizabeth 4, N.J.

16. Bar and Angle Shear, in 50 tons capacity, is illustrated and described in flyer available from The Shearease Co., P.O. Box 125, Torrance, Calif.



(See Number 9)



(See Number 10)



(See Number 11)

Changing to NELCO Carbide Tipped Cutters gives Hinge Manufacturer Tremendous Competitive Advantage!

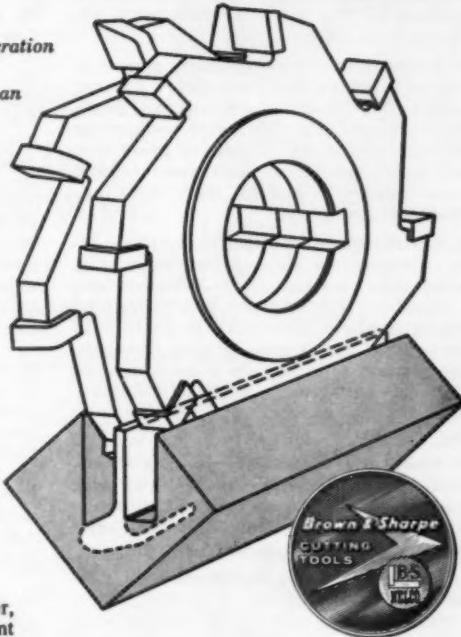
Drawing shows one milling operation that eliminated 5 others and completed cuts 6 times faster than cutters previously used.



Brown & Sharpe Cutting Tool Engineer demonstrates faster milling speeds and improved surface finish on aircraft hinge using Nelco Cutters in gang.

A Brown & Sharpe Cutting Tool Engineer, with the approval of management in a plant making aircraft hinges, assisted in effecting substantial production savings and improved quality on dozens of production milling projects.

Nelco Carbide Tipped Cutters now mill a 72° bronze hinge piece, in one pass, at 12 to 15 inches per minute feed and produce a superior finish. Formerly, a feed of 1 inch per minute was maximum. Time for another milling operation was reduced from one hour to 2½ minutes.



Tremendous production benefits can result from B&S Tooling Service.

A B&S Cutting Tool Engineer in your shop can show you how...and he will, if requested, hold a training course for machine operators in your shop.

There's no obligation. It's all part of the new B&S COMPLETE TOOLING SERVICE. Call your local B&S Distributor today.

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Brown & Sharpe Mfg. Co.,
Providence 1, Rhode Island

Send for the
B&S-NELCO
"Condensalogs"



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FREE LITERATURE continued

- 17. Molten Metal Pumps.** The Gusher vertical centrifugal type pumps are specifically designed for handling molten salts, lead, babbitt, solders and other alloys at temperatures up to 1000°F. Models, with adequate specifications, are provided in folder from The Ruthman Machinery Co., Cincinnati 2, Ohio.
- 18. Gages.** Eleven new products appear in 56-page illustrated, pictorially indexed catalog of mechanical dimensional gages. These include pitch diameter comparator for fast checking of threads or gears, dial snap gage models, and limit type form and groove gages. Standard Gage Co. Inc., Poughkeepsie, N.Y.
- 19. Cut-Machining Catalog** includes modular, combination cutting and deburring, swing type, Rotator, Roll-A-Round, and a complete line of band saw machines. The value of cut machining, in which both cut ends of metal rods, angles, channels, I-beams and solid bar stock are cut clean with circular abrasive saws, is described. Wallace Supplies Mfg. Co., 1304 W. Diversey, Chicago 14, Ill.
- 20. Power Air Tools.** The company's complete line of grinders, sanders, and wire brushing tools is described and illustrated in Catalog G-60. Master Power Corp., Box 269, Krick Rd., Bedford, O.
- 21. Preformed Tumbling Media** are presented in folder for use in barrel and vibratory finishing operations. Seven shapes are available, in various types for specific metals. Fortune Industries, Inc., 11770 Dexter Rd., Chelsea, Mich.
- 22. Resistance Welder Manufacturer's Assn.** has issued a leaflet telling the story of its service to industry and to its members. It illustrates the many educational aids available to the welding industry and includes the Assn.'s publications. RWMA headquarters, 19000 Arch St., Phila. 3.
- 23. Fatigue Testing Machines.** The Riehle-Los machines are said to have unrestricted capacity, ranging from 12,000 to 300,000 lb., and can handle deformations on loading strokes up to 6" as standard, and more if needed. The machines accommodate a wide range of load, stroke and frequency demands. Bulletin is offered by Riehle Testing Machines, E. Moline, Ill.
- 24. Power Presses.** Folder SD2-60 details straight sided double crank mechanical power presses. A chart lists standard and extra features available on the presses. Cleveland Punch & Shear Works Co., Cleveland 14.
- 25. Localized Color Filling & Application** is title of printed article which discusses a mechanical means of applying filling to embossed, die cast, engraved and other sunken designs, lettering and decorations, eliminating old hand filling problems. Printing machines for printing manufactured products are also described. The Acromark Co. 15 Morrell St., Elizabeth 4, N.J.
- 26. Cap Screw Bulletin** gives complete specifications, dimensions and data on the new 1960 Cap Screw series, and compares the new series with the old. Set Screw & Mfg. Co., Bartlett, Ill.



(See Number 18)



See Number 19)



(See Number 20)

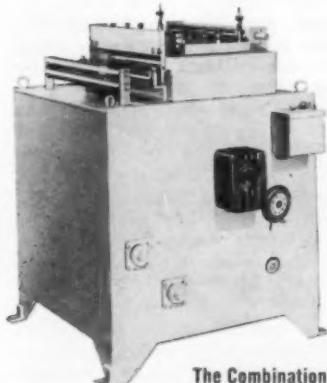
What's NEW in Press Room Equipment?

See these **benchmasters** for
IMPROVED FEEDING METHODS,
BETTER LOW-COST PRODUCTION!



benchmaster MAF MACHINE

Motorized Automatic Feeding (MAF) Machines supply uniform measured lengths of flat strip or coil stock to any secondary machine. They cycle either manually or by linking to a machine for automatic feed. Stock is pulled from a reel, or preferably, from a KOIL-KRADLE slack loop. Feed length is adjustable from 3" to 60". Stock widths up to 12" wide. Other capacities on special order.



benchmaster FS MACHINE

The Combination Length Feeding and Straightening (FS) Machine automatically straightens flat strip or coiled stock and supplies measured lengths to a secondary machine. It also pulls from a reel or KOIL KRADLE slack loop. By first removing curl, camber, kinks, etc., stock feeds faster with greater accuracy, improves production and quality of parts.

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benchmaster

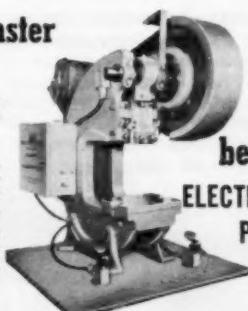
World's largest
manufacturer of small punch
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IMPROVED benchmaster ELECTRO-MAGNETIC PUNCH PRESS CLUTCH

A safe, manual or automatic punch press clutch that eliminates sliding keys, breakage hazards and time lag...pickup occurs at any part of flywheel rotation. Dual purpose cam switch prevents double tripping. Single trips or operates continuously, other electrical control settings for manual set-ups, foot control, 2 button hand control or automatic operation. Also available: Air Clutch and Mechanical Clutch equipped punch presses.

FREE LITERATURE continued

27. Carbide Cutting Tools. 24-page Catalog No. 114 covers Dixie Tool's complete line of standard carbide cutting tools and special engineering services. Complete specifications are given on end mills; die sinking, routing and keyway cutters; drills, burrs and file sets. Introduced is a new tool—a solid carbide bore reamer that bores and reams all in one operation. Dixie Tool Industries, 4555 W. Franklin Ave., Bridgeport, Mich.

28. Diamond Grinding Wheels. Form ESA-310 describes Simonds Abrasive Co.'s diamond grinding wheels, featuring both man-made and natural diamonds. Grain and grade recommendations, operating data and illustrations of all standard shapes are included. Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.

29. Hardness Conversion Chart shows approximate relation between hardness by various testing systems and tensile strength of carbon and alloy steels. The hardness systems covered are Brinell, Monotron, Vickers, and Rockwell (B, C & E scales) and Scleroscope. Babcock & Wilcox Co., Tubular Products Div., Beaver Falls, Pa.

30. Hydraulic Milling Machine. Photographs, diagrams and floor plan drawings point out the value of the Kent-Owens No. 3-36 miller. It has automatic hydraulic table feed, table working surface of 64" x 16" with 36" table travel, and fully automatic cycle. Kent-Owens Machine Co., 958 Wall St., Toledo 10, Ohio.



(See Number 30)

31. Automatic Recessing Tool, as described in recent brochure, cuts recesses to exact depth, width, and position in one operation. It will complete a recessing job in 3 to 7 seconds. Madison Industries, Inc., P.O. Box 1137, Providence, R.I.

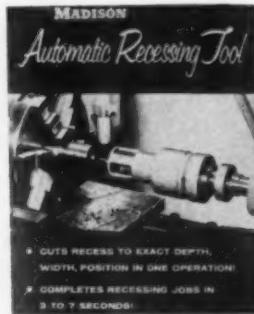
32. Annular Form Grinder. A machine for grinding annular forms and grooves in workpieces up to 10" in diameter and 24" between centers is presented in Sheffield's Catalog No. FG-181-260 on the Model 181 Multiform grinding machine. It uses the Crushtrue® grinding wheel dressing process to grind multiple diameters or forms up to 4" wide in one operation with single or multiple wheels. The Sheffield Corp., Dayton 1, Ohio.

33. Product Printing Machines, in eight types, are used for printing plastic products and for filling or applying color to sunken design, lettering or decoration. Flyer from The Acromark Co., 15 Morrell St., Elizabeth 4, N.J.

34. "Coatings For Vacuum Metallizing" presents the application and use of vacuum metallizing coatings which may be applied by spraying, dipping, and flow coating to thermoplastics, thermosetting plastics, metals and glass. Bee Chemical Co., Logo Div., 12933 S. Stony Island Ave., Chicago 33, Ill.

35. Wire Cloth Fluid Filter Elements. Brochure No. 142 covers typical fluids and systems which can use Bendix Poromesh and Micromesh wire cloth filters. Bendix Filter Div., 434 W. 12 Mile Rd., Madison Heights, Mich.

36. Abrasive Compound. Carborundum's new folder on Carbo-Latex P5 describes a new synthetic latex abrasive compound



(See Number 31)



(See Number 32)

No Finer Equipment FOR **MEASURING FLATNESS** EASIER . . . MORE ACCURATELY

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So accurate . . . so easy to get flatness readings down to 1/10 of a light band with the Lapmaster line of Optical Flats. Special manufacturing technique and laboratory control assures uniform flats of highest quality.

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FREE LITERATURE continued

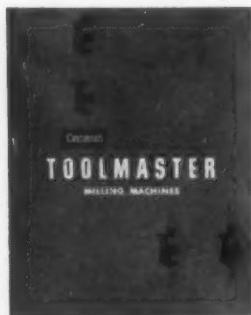
for safety on anti-skid floors, stair treads, sidewalks, highways, and airstrips. The Carborundum Co., P.O. Box 337, Niagara Falls, N.Y.

37. Internal Spline Gage. Comtorplug expanding plug gage is equipped for "between-pins" gaging of internal splines and gears as quickly and easily as gaging plain round holes. Bulletin No. 50 is offered by Comtor Co., Waltham 54, Mass.

38. Precision Surface Grinders. Bulletin No. 560-1 describes the Covel "Compact" line of grinders from 6"x12" to 10"x16" capacity in both hand and power feed models. Included also is the entirely new No. 6A cutter and tool grinder featuring a swiveling head which tilts 15° either side of center for quick and simple clearance angle adjustments. Covel Mfg. Co., Benton Harbor, Mich.

39. Plug Gages. New approaches to gaging problems are pictured and explained in four-page booklet, showing suggested uses of Tenth Plug gage kits and Precision Micro Ball gage kits. Deltronic, 929 Baker St., Costa Mesa, Calif.

40. Milling Machines. Toolmaster milling machines are available in four different styles: 1B, 1C, 1D, and 1E, the difference between each model being the spindle carrier design. All other machine extras are identical. Publication covers by description and illustration design highlights and benefits, Toolmasters on the job, dimensional drawings, specifications, functional diagrams, and standard equipment. Milling Machine Div., The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.



(See Number 40)



See Number 41)

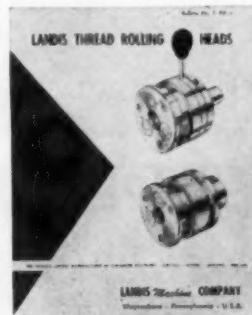
41. Transfer Machines, Dial Feeds, Indexing Components. Catalog No. 160 is a 40-page compilation of standard roller gear drive indexing mechanisms, high speed precision index tables, in-line transfer machines and allied equipment. Complete load ratings, dimensions and installation data are presented in table form. Ferguson Machine Corp., 7818 Maplewood Industrial Court, St. Louis 17.

42. Thread Rolling Head Bulletin F-99-3 has been revised recently. Prior to the revision, the bulletin covered in detail the No. 5 and No. 7 thread roll heads. Included now is the No. 3½ thread rolling head, having a N.C. and N.F. range from 7/16" to ¼". Landis Machine Co., Waynesboro, Pa.

43. Miniaturized Toggle Clamps. "Tiny Toggle" and miniaturized clamps are described in Bulletin No. 102105. Featured are De-Sta-Co Series 102, miniaturized, vertical-handle toggle clamps, and an improved De-Sta-Co Series 105 horizontal-handle "Tiny Toggles." Detroit Stamping Co., 340 Midland Ave., Detroit 3.

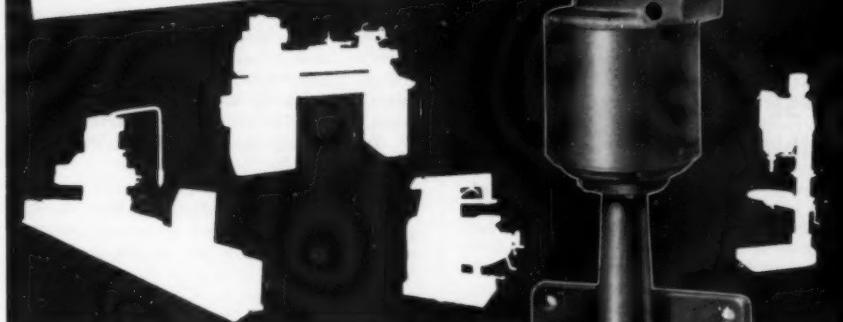
44. Deep Hole Drilling, its development and general description of the drills used, is covered in folder, which also provides the specifications needed for ordering the deep hole drill tips, shanks, and bushings. Pratt & Whitney Co., Inc., 22 Charter Oak Blvd., W. Hartford 1.

45. Printed Circuit Board Drilling machines. Brochure explains how Micro-Path gives a choice of two machines—Model MC for manual control and the automatic Model MPC operating with



(See Number 42)

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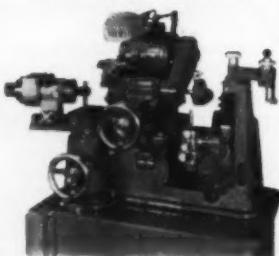
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FREE LITERATURE continued

magnetic tape control for higher production and greater accuracy. Micro-Path Inc., 4949 W. 104th St., Inglewood 2, Calif.

46. Vertical Milling Machine. The Index "45" is emphasized in literature as offering highest efficiency due to ease of operation and convenience of controls. Machine has accuracy of a square overarm which locks without distortion at any point of its travel. Longitudinal travel, 26" to 32", depending on table size; nine spindle speeds from 80 to 2700 rpm; table surface, 40"x 9". Index Machine Co., 543 N. Mechanic St., Jackson, Mich.

47. Standard Terminal, the Miller re-coil, provides a simple and practical mounting for work coils to fit all induction heaters. Illustrations and diagrams point up its usefulness. L. C. Miller Co., 5005 E. Slauson Ave., Los Angeles 22, Calif.

48. "Maintenance of Unitized Tooling" enables the reader to apply many efficiencies plus cost and time saving suggestions to his own unitized tooling. The 20-page booklet is written by Mr. Ray I. Smith, Jr., industrial engineering supervisor at the Butler Mfg. Co. of Galesburg, Ill., reportedly the world's largest user of unitized tooling. Punch Products Corp., 3800 Highland Ave., Niagara Falls.

49. Vises. The Desmond-Simplex vises, as covered by illustrations, descriptions, and dimensions, include machinists' vises, drill press and milling machine vises, woodworkers' vises, etc. The Desmond-Stephan Mfg. Co., 224 S. Walnut St., Urbana, Ohio.



(No. 46)



(No. 47)

50. Saw Blades. Band saw blades and hand hack saw blades are described in folder. They are available in all widths and tooth sizes and are sold in all widths, joined and precision welded to any length or in 100' and 500' coils. Complete specifications are provided. Hakansson Industries Inc., 12933 S. Stony Island Ave., Chicago, Ill.

51. Milling Machine Arbors and Adapters. A new folder discusses the new line of J & S No-Bend milling machine arbors and adapters with live bearing supports. The arbors are interchangeable with 40 to 50 taper adapters. J & S Tool Co., 87 Dorsa Ave., Livingston, N.J.

52. Straight Thread Cylinder Ports, for Hannifin Series "H" hydraulic cylinders, are presented in Bulletin Supplement S-113-1A. A table helps determine the proper straight thread port sizes for 1½" through 8" bore cylinders. Hannifin Co., Des Plaines, Ill.

53. "The Root of the Thread." Actual Achilles heel of properly made tension bolts and screws is the shape at the bottom or root of the screw thread. This root should be larger, rounder, and better controlled on fasteners. This pamphlet provides designers and fastener users with a thorough review of the situation. Standard Pressed Steel Co., Box 336, Jenkintown, Pennsylvania.

54. Salt Bath Furnace. Bulletin No. 151, "Lindberg-Upton Salt Bath Furnaces," describes and illustrates the advantages of the graphite "continuing" electrodes in salt bath furnaces. Lindberg Engineering Co., 2450 W. Hubbard St., Chicago, Ill.

55. Guide to Thread Gaging. A new catalog has been published on the complete Johnson line of Ring-Snap, Roll-Snap Comparators. Included also is essential technical information, including recommended gaging procedures. The Johnson Gage Co., Bloomfield, Conn.

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4"	8	1"	35.75
5"	12	1¼"	41.50
6"	17½	1-9/16"	48.00
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18"	200	4½"	261.00
21"	262	5"	320.00
24"	324	5½"	390.00



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Includes 4 operating screws, 4 reversible jaws, 4 bolts, 1 key

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4½"	8	1"	\$ 50.50
6"	16	1-9/16"	35.00
8"	34	1¾"	51.00
10"	60	2"	62.50
12"	80	2½"	74.50
14"	98	3"	84.00
16"	126	3½"	105.00
18"	166	4"	140.00
20"	204	4½"	165.00
22"	246	5"	205.00
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ternal torque adjustments from 10 to 100 inch-pounds. Available on all Thor air screwdrivers and nut setters and on Thor electric tools. Your Thor factory representative or distributor will show you the tools that think for themselves. Thor Power Tool Company, Aurora, Illinois. Branches in all principal cities.

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news of the industry

14



Francis A. Pratt
(1827-1902)



Amos Whitney
(1832-1920)

Pratt and Whitney *View 100 Years' Progress*

West Hartford, Conn.—Pratt & Whitney Co., Inc. of West Hartford, one of the world's largest manufacturers of machine tools, cutting tools and gages, celebrated its 100th birthday in May.

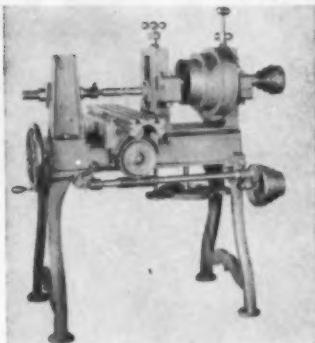
Francis A. Pratt and **Amos Whitney** founded the company in Hartford in 1860. Beginning as a two-man shop, its founders operated in off-hours from jobs in another Hartford factory. Today production comprises some 2,000 different items spanning the entire range of the machine tool, gage and cutting tool industry. Products include completely automated tape-controlled machine tools and automated gaging systems capable of the supreme accuracies demanded by the Space Age.

The plant on Charter Oak Boulevard has been

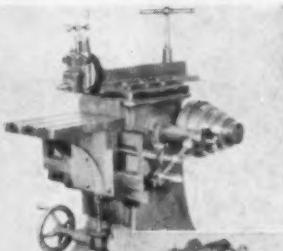
Pratt & Whitney's present home in West Hartford.



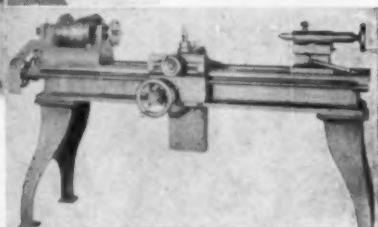
It started like this in 1860 . . .



(Fig. 1)



(Fig. 2)



(Fig. 3)

(1) Among the first machine tools built by Pratt & Whitney about 1860 was this "Lincoln" power miller named for President Lincoln. (2) This horizontal shaper was also built circa 1860. (3) In 1865, the firm built its first lathe with weighted carriage. These three P & W machines are preserved in the Ford Museum's collection of early machinery at Dearborn, Mich.

its home since 1940. Formerly famous Charter Oak Park, 14 modern buildings cover approximately 115 acres of beautiful lawns, trees and recreational areas. Some 3,000 employees report for work each day. Mostly highly skilled workers, they come from 97 Connecticut cities and towns. Of these, 597 employees have been with the company for 25 years or longer.

Special events began May 7 when the 597 members of the Quarter Century Club held their annual banquet at the Hartford Club. Employees and their families happily gathered for the 100th Birthday Party on May 14. Culmination of the 12-day celebration was the Centennial State Dinner, May 18, which brought together more than 300 of Connecticut's civic, business and industrial leaders. Gov. Abraham Ribicoff gave the principal address of the day.

In a message sent to Jacob J. Jaeger,



Jacob J. Jaeger, president

president, congratulating Pratt and Whitney and its workers, Gov. Ribicoff wrote, "Industry provides the foundation of Connecticut's economy, and Pratt & Whitney Co., Inc., is one of the foundation stones of Connecticut industry. The state is proud of your energy, your skill and the quality of your craftsmanship," he added.

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For angular spacing jobs so precise you could never handle them before

NO. 2 ULTRA-PRECISE TABLE.

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GUARANTEED POSITIONING ACCURACY FOR SHOP USE

All points in 90° increments, from zero to ± 1 sec.
All points in 18° increments, from zero to $\pm 1\frac{1}{2}$ sec.
All points in 2° increments, from zero to $\pm 1\frac{1}{4}$ sec.

Worm accuracy— $\frac{1}{4}$ sec.

Repetition of settings— $\frac{1}{2}$ sec.

Total error in any position—2 sec.

2 sec. = .00005" ($\frac{1}{2}$ tenth) on 10" dia.

Now...with this new No. 2 Moore Ultra-Precise 11-inch 2 sec. Rotary Table—you can provide the closest precision angular spacing needed today. It reads to 1 sec. and has an overall performance accuracy of ± 2 sec. throughout the entire 360°. It is being widely used in angular locations for guidance systems. A nondisengageable, thread-ground worm, combined with the accurately spaced teeth of its mating gear, makes this extreme precision possible. Loss of accuracy, due to repeated throwing in and out of the worm, is eliminated.

NO. 2 PRECISION TABLE

Reads direct to 5 sec.



GUARANTEED POSITIONING ACCURACY FOR SHOP USE

All points in 90° increments, from zero, $\pm 1\frac{1}{2}$ sec.
All points in 18° increments, from zero, ± 2 sec.
All points in 2° increments, from zero, ± 4 sec.

Worm accuracy—2 sec.

Repetition of settings—1 sec.

Total error in any position—6 sec.

6 sec. = .00015" ($\frac{1}{2}$ tenth) on 10" dia.

This popular No. 2 Moore Precision 11-inch Rotary Table has an overall performance accuracy of ± 6 seconds throughout the entire 360°, and reads direct to 5 sec. It is being used successfully by leading companies on government-sponsored precision jobs never before accomplished. You can use this rotary table for countless precision spacing applications on jig borers and jig grinders.

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These rotary tables are accurate in either horizontal or vertical position. Further applications are possible by using the table in conjunction with its companion unit, Model No. 2 Sine Plate.

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June, 1960

193

Dean Strand solved an unusually



Dean Strand's many years as an Abrasive Specialist and a salesman for machinery that uses grinding wheels have covered most of the problems in the book. That's why he so often finds practical solutions that are not in the book.

PROBLEM - An unusual grinding problem faced Illinois Tool Works, Chicago, when they began manufacturing a special steel gear shaper cutter. They required a grinding wheel that would generate an involute curve on the sides of the gear shaper cutter teeth, grinding with the side instead of the periphery of the wheel.

In attempting this grinding operation with competitive wheels, production was delayed by the wheels breaking down, glazing or mutilating the gear-teeth walls. It was impossible to maintain the involute shape of the teeth within specified accuracies.

SOLUTION - Bay State Abrasive Specialist Dean Strand was called in and went over every detail of the operation. He recommended a 16" diameter x 5/8" thick wheel with a highly friable aluminum oxide abrasive and a special Bay State vitrified bond modification, on Illinois Tool's gear-shaper cutter grinding machine.

RESULT - No further problems on this gear finishing application! The wheel consistently maintains accuracies to within 1/10,000-inch and, in the words of Illinois Tool's Process Engineer Ed Leighton, "we wanted a wheel that would grind without glazing, that would stand up under these unique conditions, that would give us reasonable wheel life and would enable us to get real *production* out of our machine. Well, thanks to Dean Strand, we've got it."

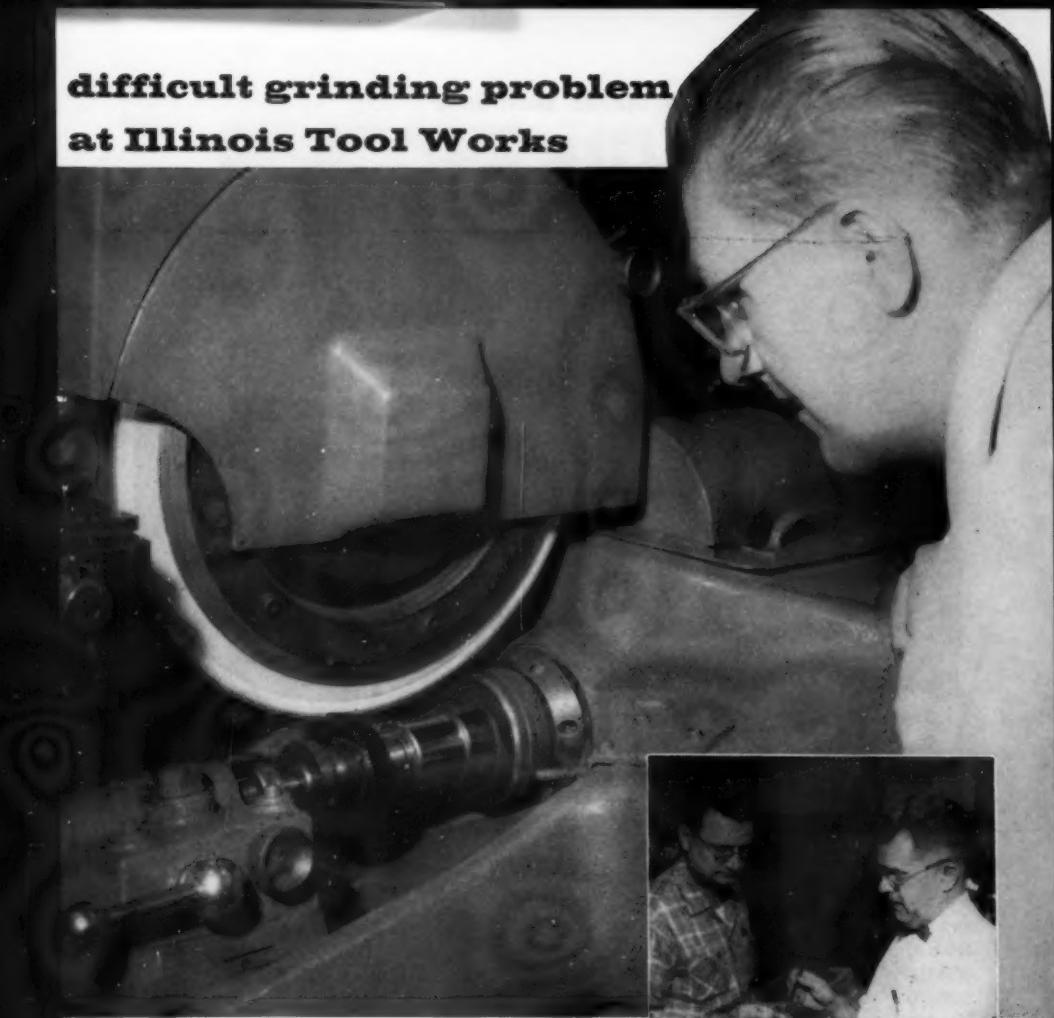
Like Dean Strand, the Bay State Abrasive Engineer in your area is a trained expert. He backs up the work of the experienced men who represent Bay State's topflight distributors; and Bay State's research labs back them both with new ideas, techniques and materials. *Better grinding at lower cost . . . that is our business.*

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194

MACHINE and TOOL BLUE BOOK

difficult grinding problem at Illinois Tool Works



(Above) Operator Dale Jackson at his gear-shaper cutter-grinder equipped with a Bay State 16 x 5/8-inch aluminum oxide abrasive wheel. Grinding is done by side of wheel instead of face. 1/10,000" accuracy is consistently maintained.

(Right) Process Engineer Ed Leighton and Inspector Leroy Wegner, of Illinois Tool Works, checking the tooth angle on a gear-shaper cutter. Extreme accuracy of the helical lead, and its involute shape, are vital to the completed product.



BAY STATE ABRASIVES

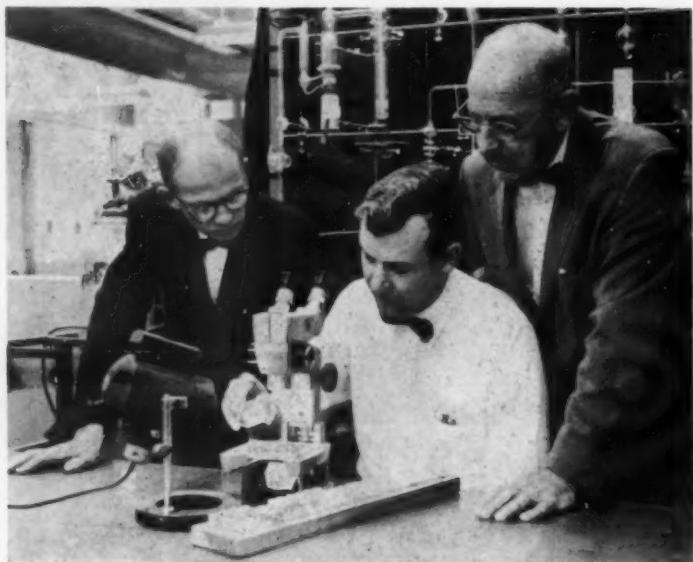
● Bay State Abrasive Products Co., Westboro, Massachusetts.

In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.

Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. Distributors: All principal cities.



Norton Co. Successfully Makes Diamonds



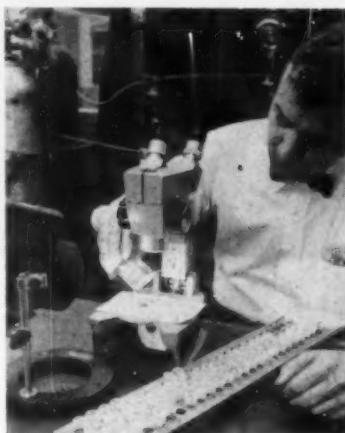
Examining Norton Co.'s man-made diamonds are, left to right: Loring Coes, Jr., assistant director of research and development; Dr. Paul P. Keat, senior research engineer; and Wallace L. Howe, vice president and director of research and development.

Norton Co. has successfully made diamonds, **Milton P. Higgins**, president, stated. This announcement confirms statement to this effect which appeared in the South African press last year.

Norton's active interest in diamond synthesis began in the early forties. At that time a project to investigate the effects of high pressure and temperature on carbon, supported in part by Norton Co., was carried out under the direction of **Professor Percy B. Bridgeman**, Nobel Prize winner and professor of physics at Harvard University's School of Engineering. This project was concluded in 1946.

The current project, which led to successful synthesis of the diamond, was given added impetus in 1953 at the Worcester laboratories of Norton Co.

Basic ideas for equipment and processes were formulated and carried forward to successful conclusion by a team



Ready to examine Norton Co.'s man-made diamonds under a microscope is Dr. Paul P. Keat, senior research engineer and member of the team which developed this artificial diamond.

of Norton researchers headed by Loring Coes, Jr., assistant director of research and development, and Dr. Paul P. Keat, senior research engineer. Milton F. Beecher (now retired) was vice president and director of research and development at the outset; and Wallace L. Howe (present vice president and director of research and development) at the conclusion of the project.

Applications for patents on both processes and apparatus have been filed.

No commercial production is anticipated at the present time, Mr. Higgins said.

Coincidentally, the announcement of this development falls in Norton Co.'s "Diamond Jubilee" as 1960 marks the 75th Anniversary of the founding.

National Broach & Machine Co. Sets Up Computer Laboratory

Establishment of a new computer laboratory within the engineering de-

DO YOU
THROW
"USED" TAPS
AWAY?

STOP

You can't afford it!

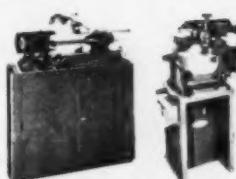
As the pictures show, taps cost roughly 6 times as much as drills. Yet it's common practice to resharpen the drill — and throw away the tap.

It doesn't make sense. And it's an awful waste of money.

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Blake makes low cost, high-precision tap grinding equipment. These easy operating tools can make your taps last up to 6 times longer . . . reduce work spoilage . . . enable taps to cut more accurately and uniformly with less strain . . . cut tap costs as much as 65%.

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Blake Chamfer Grinder/Blake Flute Grinder
used in combination, create or restore:
1. exact indexing of cutting edges.
2. controlled rake angles for each job.
3. correctly ground spiral points.
4. perfectly relieved chamfers . . .
make one tap do work of six!

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Carrying out gear production tool analysis on Bendix Alpha-Numeric electronic computer in the new computer laboratory at National Broach & Machine Co.

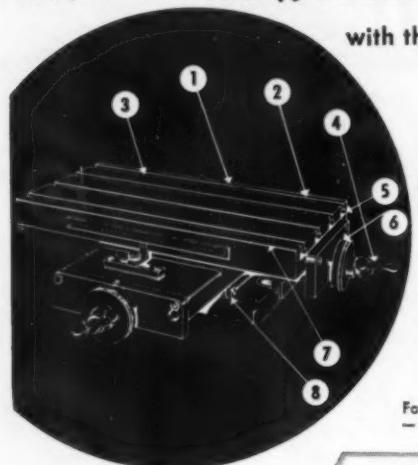
partment of National Broach & Machine Co., Detroit manufacturer of gear production equipment and broaching tools, is announced by Walter S. Praeg, president. The laboratory has been installed, Praeg explained, to meet the needs of modern industry for high-quality, accurate gears of maximum load-carrying capacity.

The company will use electronic digital computer equipment, as illustrated, in the design of gear shaving cutters, gear honing tools, master gears and broaching tools. Extensive analytical work on the design of gears and splines and related tooth shapes will also be carried out on the new equipment.

Set Lease Plan For Verson Allsteel Presses

A long-term lease plan for its complete line of standard and custom steel presses and press brakes was announced by Verson Allsteel Press Co., Chicago. The announcement was made

SAVE... 10-60% on Multiple Radii and Angle Milling



with the

COOK PRECISION *Cross Slide Table*

1. Lightweight Meehanite Castings
2. All Ways and Gibs are hand scraped
3. Top and Bottom are precision ground
4. Heat treated lead screws with 2½" bronze nuts reduce backlash to a minimum
5. 4 Tee Slots with 6" scales on each slide
6. Dials graduated from .001"-.50" per revolution
7. TOP 8" x 12"; Length 15"; Ht. 4"; Wt. 60 lbs.
8. Locking device eliminates chance of table moving

For all precision work on Mold Cavities — Plungers — Dies — Templates and other intricate milling.

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jointly by Melvin D. Verson, vice president-administration, of Verson, and



Singing the agreement setting up a long-term lease plan for all presses and press brakes made by Verson Allsteel Press Co. is Melvin D. Verson, vice president-administration, at left. Looking on is Robert Sheridan, president of Nationwide Leasing Co., Chicago, which is underwriting the program.

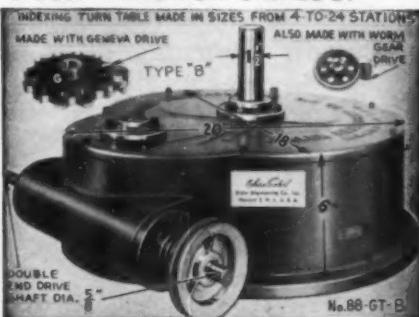
Robert Sheridan, president of Nationwide Leasing Co., Chicago, which will underwrite the lease program.

"Our new lease plan, which features terms starting at three years, will enable many of our customers to install more modern equipment immediately without reducing their working capital resources," Verson said. "In many cases, savings produced by the new equipment will more than cover the monthly lease payments for the presses. Our lease plan also will enable metal fabricators to replace obsolescent machinery more rapidly than heretofore, since it represents virtually 100 per cent financing for them."

Further information on the lease plan may be obtained by writing to the Verson Allsteel Press Co., 1355 East 93rd St., Chicago, Ill., or Nationwide Leasing Co., 11 South LaSalle St., Chicago 3, Ill.

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G&L Bickford New Trade Name Of Cincinnati Bickford Drillers

The trade name of Cincinnati Bickford radial and upright drilling machines has been changed to G&L/Bickford, according to an announcement from George K. Cassady, general sales manager, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. The new name will also be applied to universal radial drilling machines built by Giddings & Lewis in Kaukauna, Wis.

Mr. Cassady stated, "This name change is being made concurrent with the sale of our Cincinnati plant and centralization of drilling machine manufacturing in our Wisconsin facilities. Field sales, service, and distribution will remain unchanged. Internal operations will be headquartered in Wisconsin."

Giddings & Lewis has owned the Cincinnati Bickford line of drilling machines since 1955 when it purchased the old Cincinnati Bickford Tool Co.

Bay State Abrasives Buys West Coast Diamond Wheel Firm

Bay State Abrasive Products Co., Westboro, Mass., has purchased the Felker Manufacturing Co. of Torrance, Calif.

Felker manufactures diamond abrasive cutting wheels used in many industries, such as construction, marble and granite, and building. They also manufacture machines and accessories used in these industries.

The Felker Co. will be operated as a wholly owned subsidiary of Bay State under the direction of vice president, Elden L. Auker. Lester F. Kusmick will be retained as manufacturing manager and Fred K. Ryan as sales manager.

Medelton Co. Moves

Medelton Co., Inc., manufacturers of the Powerroll and Grip-Feed coil cradles and Clean-Oiler stock oiler announces its removal to new larger quarters at 262 E. 3rd St., Mount Vernon, N.Y.

ALLEN HEAVY DUTY PUNCH PRESSES

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Hundreds of different
Model Combinations
1 to 12 ton Capacities



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12 Ton—\$437.50
less motor—fab



Thousands in use the World over

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8 Ton—\$347.50
less motor—fab

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4 Ton
\$299.00
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2 Ton
\$97.50
less motor—fab



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of Heavy Duty Punch Presses.

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E. F. Houghton Co.'s New Home



Air view of new plant of E. F. Houghton & Co., manufacturers of industrial oils and chemicals, 54 Tanforan Ave., South San Francisco. Newly installed equipment includes provision for sulphonation, saponification, compounding, esterification, and condensation reactions. Plant manager is A. S. Horwitz.

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Lead Screw Tapper
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TAPPER
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Air Operated
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TAPPER
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holes at 1 stroke.
Adjustable
hole pattern



MIDGET
TAPPER
105
Pressure Sensitive Drive
Range: 0-80 to 10-24



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TAPPER
Adjustable
Torque Control
Range: 0-80 to $\frac{1}{4}$ "-16

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\$60.00

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length, 6½ inches;
chuck size ½ inch.
Wheel guard removed.
for better illustration.

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202

**Specialty Gaging Sales Agency
Formed in New England**

Recognizing the increasing need for practical engineering and technical assistance in the specification and procurement of precision gaging and measuring equipment, David M. Gaskill and William T. Nystrom have formed Gaskill, Nystrom & Co., Inc., a new sales engineering agency tailored specifically to New England industry. Address is: 761 Park Ave., Cranston, R.I. Resident sales engineers will be located in Boston, Hartford and Albany.

As a background in experience, Mr. Gaskill was successively sales manager for Cleveland Instrument Co., Brush Instruments, and Airborne Instruments Laboratory. Mr. Nystrom, for ten years with Brown & Sharpe Mfg. Co., was previously with Taft-Peirce Mfg. Co.

**Wright & Gade Tool Co. Named
Nebel Lathe Representative**

The appointment of Wright & Gade Tool Co., North Broad St., Philadelphia, as distributor for Nebel lathes in Eastern Pennsylvania, Southern New Jersey and Delaware, has been announced by The Nebel Machine Tool Corp., Cincinnati. Wright & Gade will feature the complete "60th Anniversary Line" of entirely new, proven design Nebel heavy duty lathes, including the new HXB 26/45" heavy duty extension bed gap lathe, with more and higher spindle speeds than ever before offered by Nebel.

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(H. S. S. and Carbide) for Holes from 1/16" upward
Standard and Special Boring, Facing and
Internal Threading Tools. Write for Data.

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COMET Tool Co.

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MACHINE and TOOL BLUE BOOK

Seibert & Sons Open Detroit Branch Office

Seibert & Sons, Inc., Chenoa, Ill., manufacturer of production holding tools, tool control boards, and spindle equipment, has opened a Detroit factory branch office at 18926 Schoolcraft, phone VErmont 7-5951. The company has moved its warehouse to this same location.

Operation is under the supervision of Dennis P. McCormick.

Barrett Names Representatives

Four new sales representatives to serve areas in the Midwest and West Coast have been appointed by **The Leon J. Barrett Co.** of Worcester, Mass. The companies and their territories include: **Lor-Mac Associates** (Detroit); **The Aldrich Co.** (Cleveland); **W. A. Borden Co.** (San Francisco), and **Stearns Sales Co.** (Los Angeles).

NEW PINES HIGH PRODUCTION END FINISHER

- for
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- ROD
- PIPE



New Model 660 Speeds Chamfering • Deburring • Facing • Drilling • Reaming • Tube-End Forming

- Rugged new design for high production, easy operation, faster feeds on simultaneous inside-outside deburring, chamfering, facing.
- New rigid, unitized spindle frame and heavier base retains close concentricity between the tool holder and chuck jaws.
- Simplified setup, operation, maintenance . . . one-minute speed changes with new hinged safety guard and pivoted motor mount.
- Production to 800 ends an hour . . . capacity to 2" O.D. . . . air operation, larger units or special machines are also available.

Write for catalog giving cost cutting features, production data, complete specifications.



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Specialists in Tube Fabricating Machinery

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Allman Universal Hand Tapper 5 TIMES FASTER

A great time, labor and material saver. Fixture taps five holes to every one using the free hand method. Eliminates costly tap breakage.

CHECK THESE FEATURES:

- Articulate arm swings clear of large table for placement of work.
- Limitless number of sizes of tapped holes without moving work piece.
- Vice holds work as small as $\frac{3}{8}$ " square.
- Floating tap indicates itself in hole.
- Individual spindle holds taps, thus change requires only seconds.



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- Precision made
- Fully guaranteed
- Imported

RECTANGULAR Size (inches)	TYPE Height (inches)	OUR PRICE
4 x 6	2 $\frac{1}{2}$	\$ 57.50
4 x 8	2 $\frac{1}{2}$	62.10
6 x 10	2 $\frac{1}{2}$	80.50
6 x 14	2 $\frac{1}{2}$	103.50
6 x 18	2 $\frac{1}{2}$	145.00
8 x 24	2 $\frac{1}{2}$	245.00

CIRCULAR TYPE	DIA. (inches)	OUR PRICE
4	4	\$ 42.55
6	6	71.30
8	8	101.20

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Syntron Co's President Retires



C. S. Weyandt



B. K. Hartman

Carl S. Weyandt, president and one of the founders of Syntron Co., Homer City, Pa., retired recently after more than 40 years' service. He is succeeded by **Byron K. Hartman**.

Mr. Weyandt was elected vice president and general manager in 1921 when the company was located in Pittsburgh. He assumed the presidency shortly after the company relocated in Homer City in 1937. He will now continue as a member of the board of directors of Syntron, and of the Link-Belt Co., Chicago, of which Syntron is a subsidiary.

Mr. Hartman joined the company as executive vice president and general manager in August, 1959. Previous to that, he had been associated with the Link-Belt Co. for 21 years.

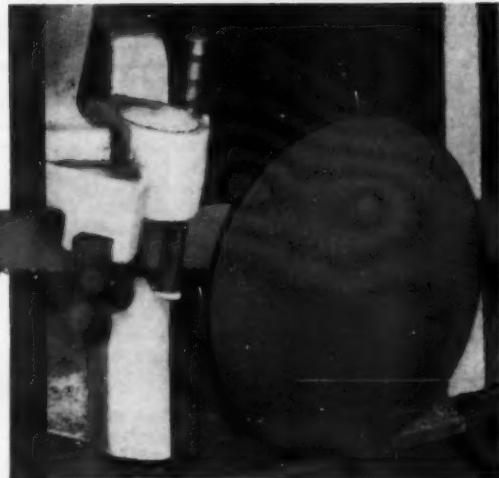


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Appointments and Promotions

Personnel Changes . . . Executive and Production



H. A. Waddell



H. R. Odell



W. L. Lukens



R. M. Held



W. Mark



F. D. Clark



R. L. Stefano

Harvey A. Waddell was elected vice president of the Gisholt Machine Co., Madison, Wis. He will continue to serve as company treasurer and as a member of the board of directors in addition to his new duties. . . Beloit Tool Corp., Beloit, Wis., has elected **Henry R. Odell** as executive vice president. One of the founders of the company, his previous position was that of treasurer. He will continue in that capacity. **K. Y. Taylor**, president; **J. W. Oliver**, vice-president, and **K. K. Zabel**, secretary, are re-elected officers. . . **William L. Lukens**, formerly assistant to the president and with the firm 24 years, has been appointed vice president and assistant to the president for National Twist Drill and Tool Co., Rochester, Mich. . . **Russell M. Held** has been named as vice president and general sales manager for the Tamms Industries Co. of Chicago. He has been with the firm since 1935. . . **Frank D. Clark**, a vice president of The Van Keuren Co., Watertown, Mass., has been appointed director of the newly created Thread Gage and Instrument Division. **William Mark**, sales manager, has been elected a member of the board of directors. . . At the annual shareholders' meeting of Latrobe Steel Co., Latrobe, Pa., the following were elected to the board of directors: **James M. Underwood**, **M. W. Saxman, III**, **William E. Howard**, and **W. G. Dahl**. Other officers named were: **M. W. Saxman**, chairman of the board and president; **J. E. Workman**, executive

vice president; **H. S. Saxman**, vice president-finance, secretary; **R. T. Eakin**, vice president-operations; **W. G. Dahl**, vice president-sales; **S. G. Fletcher**, vice president-technical director; **A. W. Smiley**, treasurer; **Henry J. Sulkey**, assistant secretary, and **Gene E. McDonald**, general counsel. . . **Donald Henry** has been named assistant general manager of Rockwell Manufacturing Co.'s Beloit, Ohio, power tool plant. . . **Edwin R. Smith, Sr.**, president, treasurer, and director for 40 years of the Seneca Falls Machine Co., Seneca Falls, N.Y., has announced his retirement. **Edwin R. Smith, Jr.** was elected president and treasurer of the firm. **Daniel V. McNamee, Jr.**, president of First Albany Corp., Albany, N.Y., was appointed chairman of the board of directors. . . **Lawrence D. Orlick** has been appointed advertising and public relations manager at F. Jos. Lamb Co., Detroit, Mich. . . Punch Products Corp. of Buffalo, N.Y., has announced **Rocco L. Stefano** as general manager for the company. . . . **Alvin J. Jones** and **D. M. Hallier**

were elected vice presidents of the Motch & Merryweather Machinery Co., Cleveland. In his new capacity, Jones will be manager of the Machine Tool Manufacturing Division at the Euclid plant of the company. Recently Hallier was made manager of the Cutting Tool Manufacturing Division and the Allied Products Division. **C. R. Kubik** and **D. M. Patterson** were re-elected vice presidents. Kubik is manager of the Machine Tool Distributor Division with headquarters in Cleveland and branch offices in Detroit, Cincinnati and Pittsburgh. Patterson is manager of the Avey Division in Cincinnati. . . Two executive appointments have been announced by the Scintilla division of Bendix Aviation Corp., Sidney, N.Y.: **Donald S. Jones** was promoted to a new position, executive assistant to the general manager, and **Thomas B. Kreutz** was named director of industrial relations, the position previously held by Jones. . . . **Charles W. Curtis** was named manager of the newly created components division of Hughes Aircraft Co., Culver City, Calif.

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Personnel Changes . . . Sales and Service



R. H. Bruce



D. Armstrong



J. M. Dill

Robert H. Bruce was appointed vice president in charge of sales for the Gisholt Machine Co., Madison, Wis. He has been with the firm since 1934. . . Punch Products Corp., Buffalo, N.Y. has announced **Ralph L. Weisbeck** as sales manager for the company. . . **Donald Armstrong** has been named assistant sales manager-field for The Van Keuren Co. of Watertown, Mass. . . The National Acme Co., Cleveland, has elected **Stanley E. Casson**, formerly director of sales, as vice president-sales. He has been associated with the company for 25 years. . . **James M. Dill** has been appointed to the newly-created position of special products sales manager for Russell, Burdsall & Ward Bolt and Nut Co., Port Chester, N.Y. . . Behr-Manning Co. of Troy, N.Y., a division of Norton Co., has re-aligned its coated abrasives sales organization, and has appointed **William J. Bennett** national field sales manager of its Coated Abrasives Division. The sales organization has been regrouped into eastern and western regions with regional sales managers, respectively, **Victor F. Perreault** and **Arthur W. Bell**. . . **Harold D. Ballard** has joined the sales force of The Lincoln Electric Co., Cleveland, and will work out of its Milwaukee office contracting accounts in Milwaukee and the southern part of Wisconsin. Ballard replaces **Donald E. Bly** who has been transferred to Appleton, Wis. to cover northern Wisconsin and the upper peninsula of Michigan for the company.



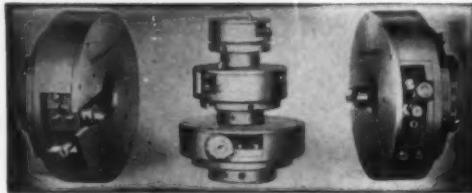
R. L. Weisbeck



S. E. Casson



W. J. Bennett



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BOOK REVIEWS

EQUITY CAPITAL AND SMALL BUSINESS. Edited by Edward L. Anthony. Published by Small Business Administration, Washington, D. C. 35 Cents.

The great majority of small business owners and managers want their concerns to prosper and grow. Two kinds of money are usually needed for growth: The first is temporary capital such as short-term funds borrowed to support bigger accounts receivable or inventories, and long-term loans to finance items like new equipment. The second is permanent or equity capital preferred in financing long-range growth.

This volume is a collection of eight articles on different aspects of equity capital, each by a separate person, rather than a uniform work by a single author. The book contains contrasting opinions, but this presents no conflict as each author brings his own ideas to bear on the subject. After study, the reader can draw his own conclusions.

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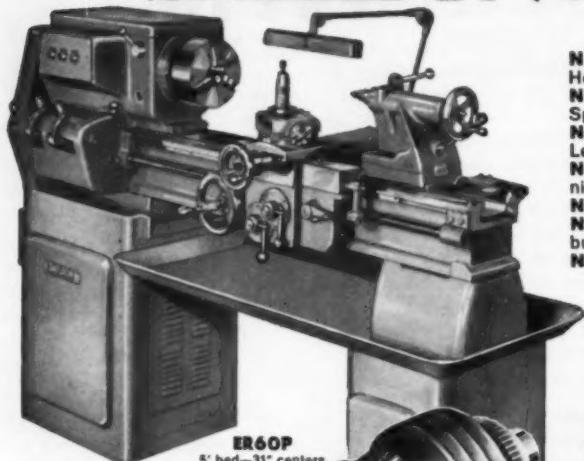
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Company Name

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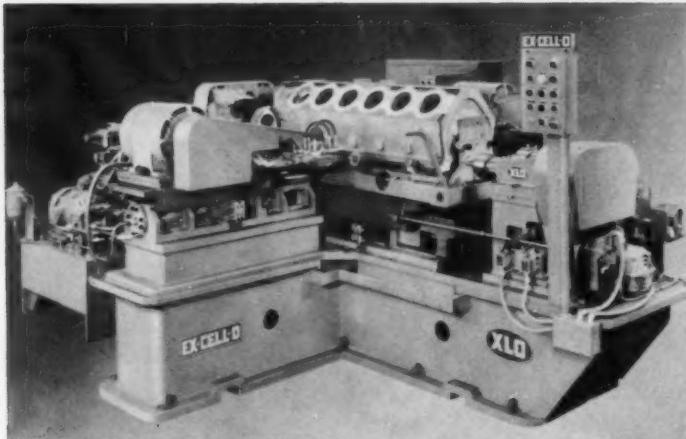
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what's new in metalworking

15



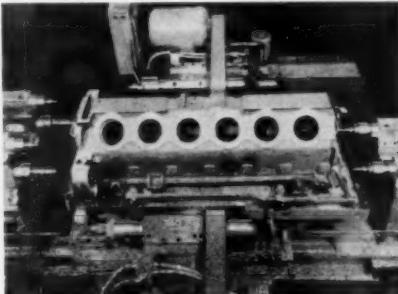
Ex-Cell-O custom precision boring machine for multiple operations on V-12 engine crankcase.

BUILDING BLOCK CONSTRUCTION FOR BORING MACHINE

This custom precision boring machine uses standard machine slides and other building block components, including a total of eight precision boring spindles.

The workpiece, a massive aluminum alloy V-12 engine crankcase is manually clamped on the fixture table, this being carried on a standard hydraulic slide. Two other standard slides are used to feed boring and facing heads toward the part. These latter slides "rapid" into cutting position at the start of the machining cycle. The slide carrying the fixture table feeds from left to right toward the facing heads. This action also feeds the workpiece toward spindles at the right hand station where two dowel holes are bored and chamfered. In order to extend tool life, an air operated, retractable boring tool is pro-

Work area showing all eight Ex-Cell-O precision spindles which perform a total of 37 operations.



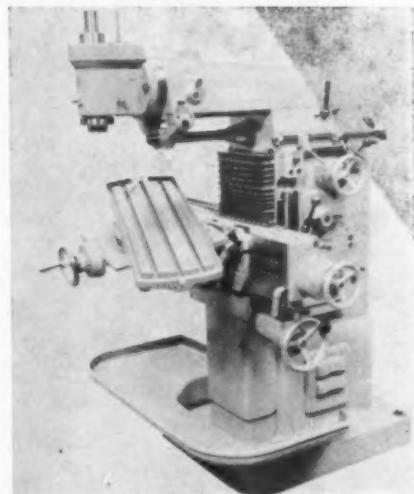
vided on each of these spindles to enable tools to withdraw after their cut is complete.

The machining cycle continues as the fixture rapids to the left, feeding toward the four spindles mounted at that end. After completion of boring and chamfering operations on this front face, the two cross slides retract clear of the fixture table, which now returns to the start position. During the cycle a total of 37 individual cutting operations is performed.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

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Workpiece May Be Arranged At Any Angle On Machine



Many attachments in tools and clamping devices available.

Advantage of the Thiel Duplex 158 milling machine is that the workpiece may be arranged at any angle relative to the cutting tool and vice-versa. Versatility is provided through the use of attachments in tools and clamping devices.

A wide machining range is offered to accommodate varied size workpieces. Throat depth between vertical milling

cutter and machine column is $27\frac{1}{2}$ "; distance between vertical spindle and table surface, $17\frac{1}{2}$ ". Large workpieces may be clamped on the base table, while smaller components may be set on either a $33'' \times 16''$ fixed table or the swiveling table. The swiveling table tilts 30° in each direction and has a cross slide movement of $5\frac{1}{2}$ ". Vertical and longitudinal table travel is $16''$, with power feed and rapid traverse in all directions. Horizontal overarm travels $8\frac{1}{2}$ " in and out.

Attachments to choose from include dividing heads, rotary tables, slotting head, powered vertical head, a 5000 rpm max. vertical drilling head, universal spiral milling device, hydraulic copying device, jig grinding head, and small tooling.

United Machine Tool Co., 3620 Santa Fe Ave., Los Angeles 58, Calif.

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Fast Cutting Grinding Disc

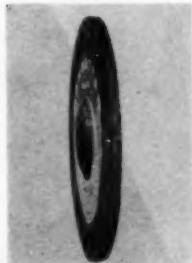
The Fast-Cut Moldisc, a new depressed center abrasive disc, is claimed to cut and remove metal faster than any similar type wheel. Other features reported include: reinforced for maximum safety, uniform cutting action, much longer life, and less operator fatigue.

The new wheel is designed for use in fabricating shops for grinding welds and beveling edges, and in foundries for notching gates and risers and trimming fins.

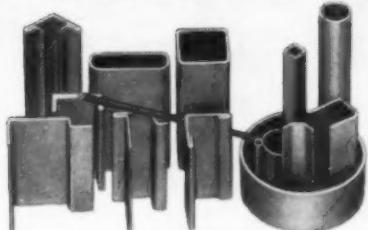
The discs are available in 7" and 9" diameter sizes in $1/8''$, $3/16''$, and $1/4''$ thicknesses.

Abrasive Wheel Dept., Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N.J.

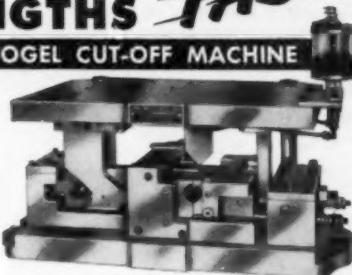
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With each press stroke, unit accurately cuts off tubing and shapes into lengths of $\frac{1}{2}'' \pm .010''$, or more. The ends are cut clean with a minimum of burr or distortion... Shearing blades make thousands of cuts before resharpening.

No. 12 unit cuts up to $\frac{3}{4}''$ O.D. x $\frac{3}{32}''$ wall.
No. 2 unit cuts up to $2''$ O.D. x $\frac{1}{8}''$ wall.
No. 3 unit cuts up to $3''$ O.D. x $\frac{3}{16}''$ wall,
or up to $\frac{3}{8}''$ O.D. x $\frac{1}{8}''$ wall.
Odd shapes handled in sizes equivalent to unit's O.D. capacity.



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	Wide	High	Deep			
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439DL	4 $\frac{1}{4}$ "	3 $\frac{1}{8}$ "	9"	325°—1850° F.	1650	120.00
436DL	4 $\frac{1}{4}$ "	3 $\frac{1}{4}$ "	6"	250°—2000° F.	1650	130.00
50L	4 $\frac{1}{4}$ "	3 $\frac{1}{8}$ "	9"	250°—2000° F.	1750	176.00
90L	6"	6"	6"	250°—2000° F.	2200	200.00
669DL	6"	6"	9"	250°—2000° F.	3000	248.00
100L	8"	4"	6"	250°—2000° F.	2000	220.00
849DL	8"	4"	9"	250°—2000° F.	3000	265.00

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Stainless steel housing
slightly higher.

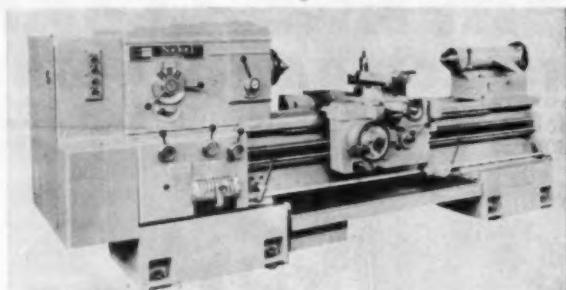
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Standard Duty Engine Lathe Features Totally Enclosed Gear Box

A new design totally enclosed gear box is one of the many features of the new Model SD 2516-20 standard duty engine lathe. This is the fourth model in Nebel's entirely new line of lathes. It offers convenience as well as precision machining, with more and higher spindle speeds than previously available from Nebel.

The heavy duty quick change gear box combines the advantages of total enclosure with the simple, reliable tumbler gear arrangement.

Sixty separate feeds from .0027 to .192 ipr, and 60 separate thread changes from 1 to 72 threads per inch are selected by removing the shifting handle



Offers convenience, precision machining, more and higher spindle speeds.

to the desired feed or lead shown on the direct reading tumbler index plate. The tumbler gear locks in position.

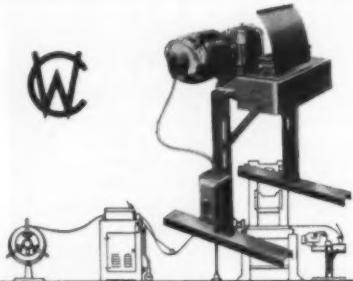
The new lathe offers 18 gear driven speeds, selected from a direct reading color index and easily controlled by two levers and color keyed speed plates. Speeds up to 1500 rpm, a new Nebel maximum, are available.

The rugged three-bearing spindle is mounted at the front and center supports on zero precision, angular tapered roller type bearings, preloaded and adjusted for maximum radial and thrust loads. A constant speed main drive motor supplies up to 20 hp.

Heavy duty design is evident throughout.

The new design quick change gear box, as well as the other new design features, are also available on the other models in the new line—Model HXB heavy duty extension bed gap lathe, and Models 2516 and 2013 heavy duty engine lathes.

Nebel Machine Tool Corp., 3428 Central Parkway, Cincinnati 25, Ohio.



Scrap choppers

Cooper Weymouth scrap choppers take skeleton strip directly from press — chop it quickly and efficiently into easily handled size for collection. Three self-contained sizes, adjustable angle heads, for stock to .156 x 5" or .093 x 12" (mild steel). Write for details.

COOPER WEYMOUTH, INC.
607 Honeyspot Road, Stratford, Conn.

Use postpaid card. Circle No. 357

Production Milling Machine Offers Automatic Cycling

A new automatic cycling miller has been added to the Sajo (Swedish) line of knee-type horizontal and vertical milling machines. The No. 2 production miller, Model 54, offers a selection of

Gaertner Optical Instrumentation
designed and manufactured in the U.S.A.

automatic table cycles, ranging from conventional one-way milling with return rapid traverse to skip-feed milling and continuous two-way milling with rapid traverse between cuts, with or without spindle braking.

The machine is fully automatic, the operator being required only to load and unload the work.

Changeover from one automatic table



A variety of automatic cycles is available—simple one way cycle, one way cycle with automatic table reverse, skip feed with automatic table reverse, etc.

cycle to another is made in a matter of minutes from the operator's position. The automatic cycling arrangement can as easily be disengaged and the machine used for conventional operator-controlled milling when desired.

The automatic cycling feature is available on either the Model 54 plain horizontal miller or on the Model 54 vertical miller. Table size is 52" x 11"; longitudinal power feed, 33½"; spindle, No. 50 NMT; main drive motor, 7½ hp; table feed and rapid traverse motor, 1½ hp.

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N.Y.

Use postpaid card. Circle No. 62



Coordinate Cathetometers reduce inspection time

Gaertner Coordinate Cathetometers are reliable optical instruments for making precise measurements in the vertical plane. Because they permit reading two coordinates in a single setting, they reduce inspection time and eliminate resetting errors.

In addition to the routine inspection applications, these instruments permit measurements on larger objects as well as objects or points in recessed, remote or inaccessible locations. They eliminate the errors and indecisions associated with mechanical-contact measurements.

Illustrated is Gaertner's M1238-1818 instrument. It has a range of 18" x 18", working distance of 9" to infinity, and reads to 0.001" up to 24" working distance. Protractor ocular reads up to 3 minutes of arc. Larger ranges are available. Smaller types provide reading to 0.0001".

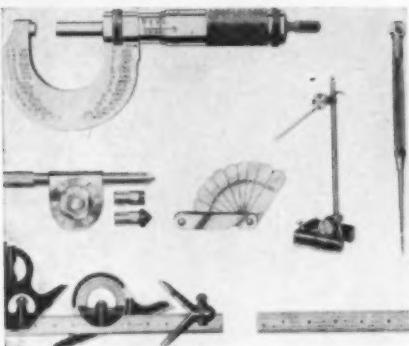
Write for Bulletin 194-57

Use postpaid card. Circle No. 358

1221 Wrightwood Ave., Chicago 14, Ill., BU 1-5335

Gaertner
SCIENTIFIC CORPORATION

16 New Machinist's And Precision Tools



Under Union's "Sweet 16" promotion 16 new tools now round out the line of professional quality precision and machinist's tools.

Highlighting this promotion is a line of six new accuracy-guaranteed micrometers, measuring by 1/1000ths in capacities of 0" to 1" or 1" to 2". Prices

are \$13.00, \$15.40, and \$19.10 for the 1" micrometers, and \$14.50, \$16.75 and \$21.00 for the 2" models.

Other new tools in the "Sweet 16" line include: combination squares and sets—\$6.85, \$9.10, and \$13.50; 6" steel rules—\$2.28, \$2.43, and \$2.50; speed indicator—\$3.30; pocket scribe—\$84; 9-leaf thickness gauge—\$.92, and surface gauge—\$7.70.

Union Tool Co., Orange, Mass.
Use postpaid card. Circle No. 63

Sturdy Cylinder Mounting

A rugged power cylinder mounting is said to permit speedy installation, is guaranteed not to shift, and eliminates the bolting, pinning and/or welding of keys. The mounting is created by providing side mounted cylinders with a flange plate ground to accurate thickness and extending beyond the mounting-side surface of the cylinder. To mount the cylinder, the cylinder user merely has to first slip the extending portion of the flange plate into a slot milled into the machine's mounting

Make cuts **DEEPER** and **FASTER**

ROOFE Live Centers, praised by users everywhere, are made of finest materials under rigid quality controls.

ROOFE Standard Type Live Centers are popular because they offer maximum accuracy, lower costs, and increased production. Available in Morse Taper, Brown & Sharpe, Jarno. Straight and special shanks furnished to meet your "special" specifications. Write for our catalog.



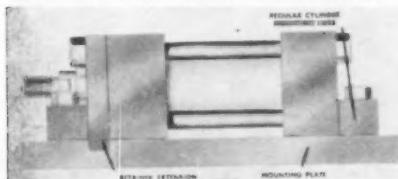
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HOUSTON GRINDING & MFG. CO., Inc.

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surface, then to secure the cylinder by means of the standard mounting pro-



vided with the cylinder.

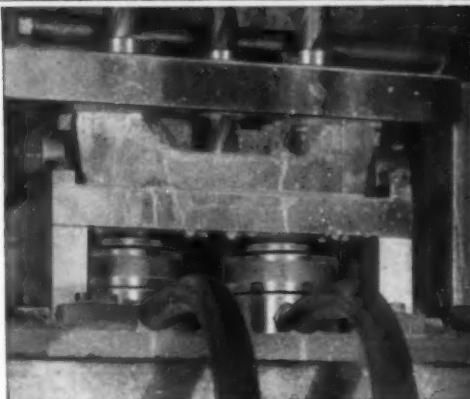
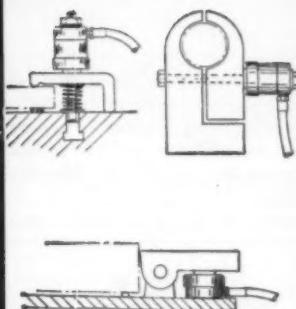
With the flange plate extension thus

locked solidly in the milled slot, cylinder cannot shift under load.

The mounting is available in mounting styles 72 (side lug), 74 (flush side), and 77 (end lug) in all bore sizes of Miller air and hydraulic cylinders and is designated by adding the suffix "k" to these mounting styles.

Miller Fluid Power Div., Flick-Reedy Corp., York and Thorndale Rds., Bensenville, Ill.

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HYDRAULIC FIXTURE LOCKING COMPONENTS BOOST MACHINE OUTPUT!

- Compact—Builds into fixtures easily
- Automate your fixtures for fraction of "do-it-yourself" cost
- Ultimate speed in work loading
- Greater locking force than any other method
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- Single or multiple locking heads available with matching air-hydraulic booster systems.

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WILTON TOOL MFG. CO. INC.

SCHILLER PARK, ILLINOIS

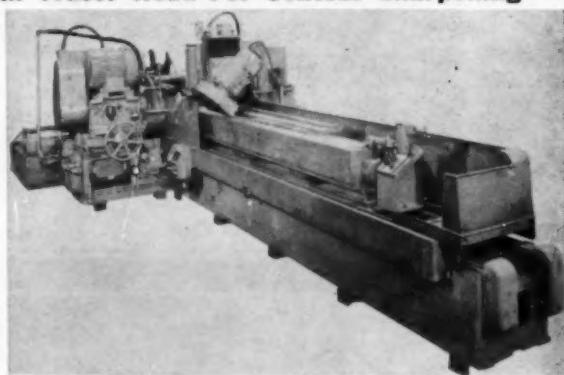
Canadian Address: 178 Norteman St., Toronto, Canada MTBB-60

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Grinder Equipped With Tracer Head For Contour Sharpening

A method of combining heavy stock removal face grinding with secondary contour cuts has been developed in a machine designed for sharpening rotary crop shears. Mattison Machine Works now equips its standard No. 2000 traveling-table face grinder with an auxiliary swiveling head for contour sharpening. The head floats laterally and is controlled by a tracer to reduce part-handling time and costly special equipment.

Rotary crop shears use a male and female blade to cut a large radius at the leading edge of steel slabs for easier feeding into the rolling mills. Combi-



Mattison No. 2000 traveling table face grinder with tracer head. nation of counterweighting and anti-friction spindle carriage mounting permits the wheel to follow the desired shape, as controlled by the template. Thus compound angles of the blades are ground.

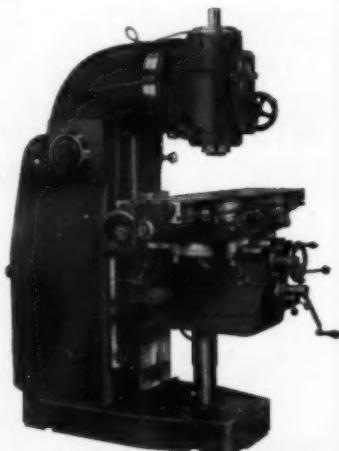
The auxiliary head is easily dressed

POWER PERSONIFIED **SAJO No. 2 Vertical Miller**

Just a glance at this rugged machine confirms its ability to perform with ease the most demanding jobs. Sajo's swivelling head, power feed to quill and unrivaled spindle construction combine versatility with unsurpassed tool room accuracy.

Also available —
Horizontal Millers
Plain and Universal

No. 2 Vertical Miller
table size: 52" x 11"
7½ and 1½ HP motors
rapid power traverse



austin industrial corporation

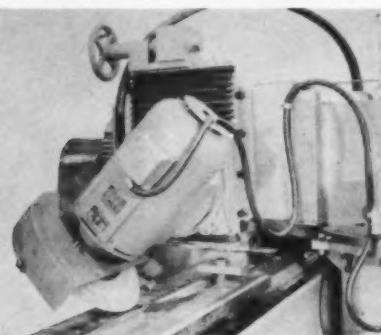
76-G Mamaroneck Avenue

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White Plains, New York

by two manually operated dressers mounted on a special base at one end of the table.

The hydraulically driven table on the grinder is pulled in both directions by two opposing cylinders to provide uniform, smooth travel. The outer way is



Combination of counterweighting and anti-friction carriage mounting allows the wheel to follow the desired shape, as controlled by this template.

flat, while the V-shaped inner way takes lateral thrust and guides the table. This design is reported to assure excellent finish and accuracy when grinding shear blades, wear strips, etc.

The face grinder with the head handles work lengths from 50" to 220".

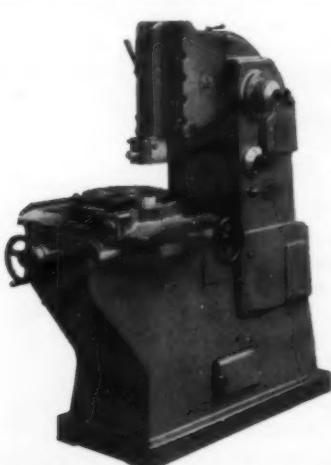
Mattison Machine Works, 545 Blackhawk Park Ave., Rockford, Ill.

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Cutting Tool Centering Gage

A fast and extremely accurate method of setting lathe-type cutting tools to the work centerline is claimed possible by the new Tru-Center gage. It is easily carried in the operator's pocket.

A machined aluminum body attaches itself to the cylindrical work piece with cylindrical precision locators which are magnetized by ceramic magnets inset in the body and in contact with the locators. If the work piece is of non-magnetic material, such as aluminum



SPEED AND FLEXIBILITY

— with cost-cutting Vertical Shapers

Easily set up and using the simplest tooling, the CHOMIENNE M-5" with its combination of longitudinal, transverse and rotary table movements, angular ram adjustment and ram speeds up to 270 strokes per min. solves production "problems."

Also available —
Vertical Shaper, 12" with
28½" Rotary Table, 5 HP motor.
Horizontal Shapers, plain and universal
12" to 30" stroke, 2 to 10 HP motors

5" Vertical Shaper
12½" Rotary Table
2 HP motor



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June, 1960

219

Enco Turrets Assure ±.0005" Accuracy



Enco's passion for exacting accuracy is paying off in metal working operations everywhere! Combining precision lathe output with efficiency and economy has become a necessity . . . and Enco turrets have proved the ideal answer. An Enco turret transforms one lathe into a production machine, each operation of unsurpassed accuracy due to *spring loaded ball design!*



Spring loaded balls give you the accuracy you want! Hardened steel precision balls locked between accurately milled spherical seats consistently give accuracy in re-indexing. Hardened all steel construction minimizes wear, retains built in precision.

Also Mfrs. of Enco Hexurret Bed Turrets

Write today for catalog No. 53.

There's an ENCO turret for every lathe.

Enco

MANUFACTURING CO.

4520 West Fullerton Avenue
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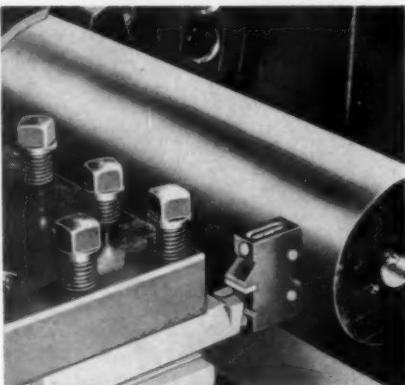
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220

or brass, the gage may be held in place with a neoprene rubber band.

A spirit level is inset in both edges which enables the gage to be positioned to a degree of accuracy which can be measured in ten-thousandths of an inch.



This enables the lathe tool to be positioned either on the exact centerline or to a known amount above or below the centerline as desired.

There are two sizes offered which cover shop uses from the smallest automatic screw machine to the largest lathe.

Tru-Center Products Co., P.O. Box 731, Decatur, Ill.

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Air-To-Oil Booster

S-P air-to-oil booster with integrally mounted tank is designed to boost ordinary air (80 psi) up to 3000 psi hydraulic pressure. No need of added power, pumps or motors.

The S-P Mfg. Co., 30201 Aurora Rd., Cleveland 39.

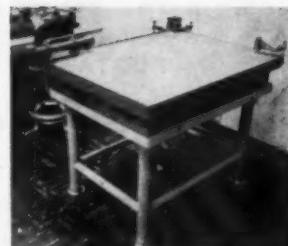
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"Extreme Tolerance" Surface Plates

A new line of "extreme tolerance" granite surface plates has been designed for operations involving ultra precision measurement to extremely close tolerances. An over-all surface tolerance guaranteed to .00001" is reported. Sizes range from 8"x12" to 30"x42" in no-ledge, two-ledge, and four-ledge styles. Threaded inserts can be provided for attaching special fixtures. The manufacturer states long life and dimensional stability is afforded by granite quartz construction.

Herman Stone Co., 1860 N. Gettysburg, Dayton 27.



Surface tolerance to .00001".
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dust
collection—
simplified!

Now, with more than fifty models in the Dustkop line—plus efficient accessory items—the odds are that a standard unit will solve your problem. Dustkop units solve other problems too. They're easier to install, save space and money and are virtually maintenance-free!

how to select a dust collector

This new brochure includes all basic information needed to select the right dust or mist collector for grinding, buffing, polishing and other types of service. Write for your copy. No obligation.



AGET

Manufacturing Company
1402 Church St., Adrian, Michigan

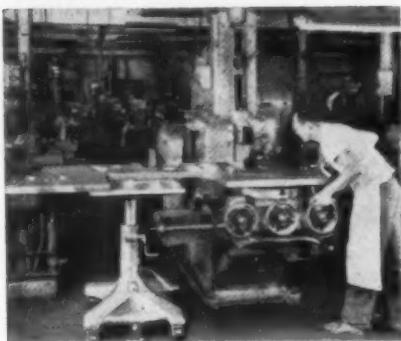


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*2000 LBS. OR 1000 LBS. CAPACITIES

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A precision made MIDWEST TABLE Costs no more!

- ✓ It's hydraulic . . . positions work or feeds at desired height without use of hands
- ✓ Rigid cast construction
- ✓ Top turns 360° and clamps
- ✓ Foot release valve to lower
- ✓ Machined top surface can be used on work table
- ✓ Roller bearing casters with ball bearing swivels
- ✓ Floor clamping available extra

Write today . . . specials on request

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MANUFACTURING COMPANY
112 WEBSTER ST., DAYTON 2, OHIO

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Precision Tool Room Jig Borer With Built-In Rotary Table



Conveniently located micrometer projectors offer quick, positive, and accurate settings, ideal for inspection or machining of parts in small and large quantity.

The Atlantic No. 6000 Series jig borer with built-in rotary table is reported to offer a quick method of positioning for longitudinal and cross motion within .0002", ideal for inspection or machining of parts in small quantity.

Conveniently located micrometer projectors offer quick, positive and accurate settings. Longitudinal and cross table movements are convenient from the operator's position. Feed and speed pre-selection are by means of push button.

Spindle speeds are featured in a low range gearing of 30 rpm to 250 rpm and in a high range of 270 rpm to 1500 rpm. Speed is infinitely variable, at any range by simply pushing a button. Electric clutches permit three distinct feeds per spindle revolution, .001, .003 and .006.

The machine is designed to withstand heavy duty milling, drilling, and boring to precision machining specifications.

Uses include building of jigs, fixtures, molds, dies, gages, etc., in metals from aluminum to zinc.

Specifications include: table working surface, 20"x40"; table travel longitudinal, 35"; table travel cross, 18"; table top to spindle maximum, 25½";

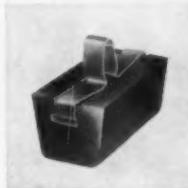


DOUBLE END, FOUR FLUTE THRIFTMILL is the latest addition to the Thriftmill line. As the others, it is ground from solid metallurgically tested high speed steel. The mill is designed for economical milling of over 80% of end milling operations. Six sizes are offered—1/8", 3/16", 1/4", 5/16", 5/8", 1/2". Cutting Tool Div., Brown & Sharpe Mfg. Co. Providence 1, R.I.

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SELF-RETAINING RUBBER PARTS. The Cooper Clip consists of a rubber extrusion and a metal clip. This clip positively retains the rubber, in addition to acting as a fastener for the entire unit. Applications have proven successful under static and dynamic loads. Of the varied styles offered, the C-2 tapered foot is shown. Cooper Tire & Rubber Co., Findlay, Ohio.

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Cuts up to
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PAYS for ITSELF NO MATERIAL LOSS

Continental **PIPE AND TUBE Rotary Cut-Off Machine**

It zips right through tubes from $\frac{3}{8}$ " to 1 $\frac{1}{4}$ " O.D., from light gauge to 16-gauge wall thicknesses. Adjustable table with Tri-Roller Assemblies and Manual Stock Loader. Also Cut-Off Machines up to 12" diam., air or hand-operated.

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Continental

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SINCE 1919

machine co.
CHICAGO 18, ILL.

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Hanson-Whitney has now standardized its line of Taps for "off-the-shelf" selection with all types and sizes measuring up to the most exacting requirements.

These Taps can be used at high speed operation on the difficult modern metals required in today's production.

H-W products are stocked by leading Distributors, with Technical Engineering Service readily available.

THE Hanson-Whitney COMPANY

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TAPS • GAGES • COMPARATORS • HOBS • CUTTERS

THE HANSON-WHITNEY COMPANY
1269 Bartholomew Avenue, Hartford, Connecticut

Please send me the new TAP SELECTOR.

It's free.

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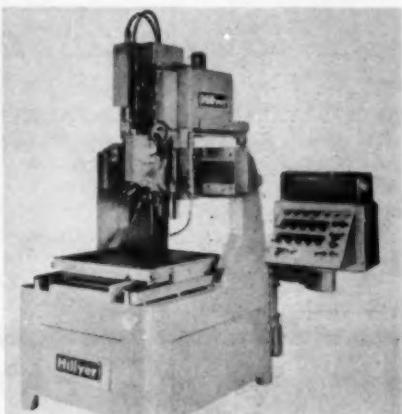
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Machine Controls and Programs Drilling and Other Operations

Drilling, tapping, reaming, boring, and straight-line milling operations are fully controlled and programmed by the new line of Hillyer numerically controlled drilling machines. These machine tools permit spindle speed, feed rate and depth settings to be fully controlled by both tape and dial along with



Tape and dial control spindle speed, feed rate, and depth settings.

conventional x and y coordinates. Any combination of these three settings may be selected for any spindle at any time, permitting a given tool to be programmed to varying levels and varying depth of holes, all on the same work-piece.

Jigs and fixtures are completely eliminated. Accuracy and speed of operations are greatly improved, the manufacturer also states, with holes located and drilled to accuracies of .001" per foot.

The dial control panel and tape reader are mounted integrally with the machine. Tape preparation is simple and speedy.

Hillyer Corp., 331 Centennial Ave., Cranford, N.J.

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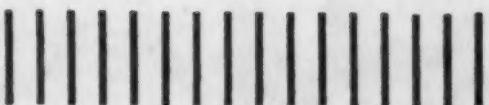
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Metal Insert Added to Tip Of Safe-T-Grip Hammer

Changes reported for the Safe-T-Grip hammer include addition of a metal insert to the tip and burnishing the handle until it resembles chrome. The manufacturer's guarantee covers stripping threads in the tips and on the stud, and breakage of the handle. Even wear is obtained on the tips by loosening, then rotating the worn spot. Finger grips on the handle are a safety feature.

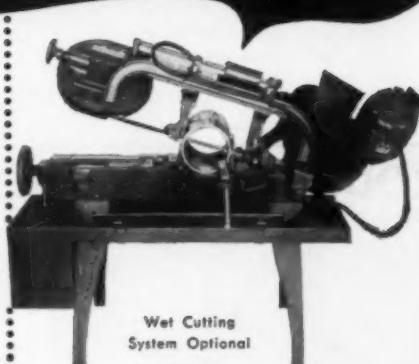
R. W. Hughes Industries, Inc., 2713 Ludelle, Fort Worth, Texas.



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Wet Cutting
System Optional

Rugged in design, dependable in operation, the Wells Model 600 is the ideal saw for tool and stock rooms . . . gives excellent service on medium production jobs. Uses $\frac{5}{8}$ " blade. Adjustable, uniform gravity feed is provided by hydraulic stabilizer and special coil spring. Casters available for portability. Write for Bulletin 260-A.



Use postpaid card. Circle No. 367

Do-It-Yourself Work Holder

A new "Erect-Your-Own" work holder has been introduced for use in light production such as assembly of electronic, aircraft, and office equipment components. It may be put together in any shape to suit any sized workpiece.

The work holder may be used with the Wilton PowRarm or bolted to work table or bench. The unit is available as a complete kit or in individual components.

The kit, No. 391, contains two 18"



perforated strips of $\frac{1}{4}$ " aluminum plate, three 90° connecting angles of the same material, two toggle clamps, and a dozen screws and nuts. Perforations measure $\frac{1}{4}$ ". Any of these parts may be purchased individually.

Wilton Tool Manufacturing Co. Inc., Schiller Park, Ill.

Use postpaid card. Circle No. 73

Cutting Grade Provides For Surface Finishes to 12 RMS

Kennametal cutting grade K165, engineered for high velocity precision machining, is said to provide for exceptional high hardness-strength for machining high temperature alloys of low machinability.

It is also claimed the cutting grade possesses greater combined crater and edgewear resistance than conventional tungsten carbide cutting tool materials.

Surface finishes as low as 12 rms and better are produced, frequently eliminating expensive grinding operations.

Kennametal Inc., Latrobe, Pa.

Use postpaid card. Circle No. 74

PRODUCTION SHORT-CUT IDEA



An all-new TEMCO electric furnace specifically designed to let you heat-treat more and bigger parts in a bench-type unit. Larger chamber size . . . 10" W. 9 $\frac{1}{2}$ " H. 22" D. Higher temperature range . . . continuous up to 2000° and 2300°F (1095° and 1260° C) . . . handles most high-speed steels.

This new Type 1800 TEMCO furnace features a close-sealing sectional door with patented lever suspension to provide limited or full access as desired. Reinforced welded steel case . . . 7 $\frac{1}{2}$ " firebrick and backup insulation. Choice of single or three-phase models, for 208, 230 or 460 volts. Available with or without controls. \$685 to \$745 furnace only.

Write for free literature and name of nearest dealer.



ELECTRIC FURNACES

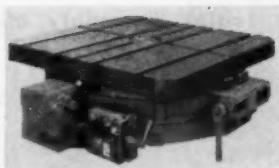
Thermo Electric Mfg. Co.
486 Huff Street, Dubuque, Iowa

Use postpaid card. Circle No. 368

Rotary Tables Index Off-Center Loads

New Airmist rotary tables will index extra-heavy loads, even when placed off-center, the manufacturer reports. A special valve design prevents the air-oil mist from spilling out the light side of the table. Tables are available in sizes starting at 36" round or square; special sizes on order. The tables may be used with horizontal boring mills and milling planers. Tables are also furnished on runways for use with floor type horizontal boring mills.

The Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.



Sizes start at 36" round or square.

Use postpaid card. Circle No. 75

WILSON Pneumatic Horizontal Grinders



Faster grinding...less operator fatigue

Wilson's new Horizontal Grinders speed grinding, buffing, wire wheel work and many other metal removing and finishing operations. Available in various sizes and models, with speeds ranging from 3100 to 12,000 r.p.m. Write for Catalog PT-58.

TW303

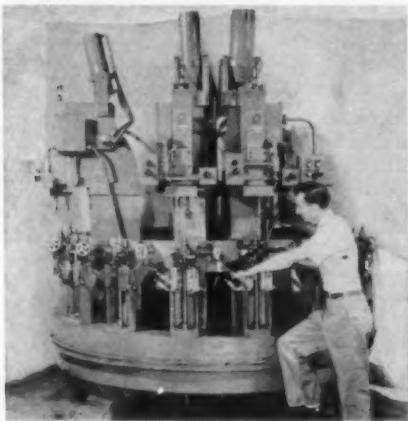
THOMAS C. WILSON, INC.

21-11 44th Avenue, Long Island City 1, New York

BETTER TOOLS FOR BETTER WORK

Use postpaid card. Circle No. 369

Circular Assembly Machine



The PDC circular assembly machine makes it possible to have heads, hop-

pers, panels, also air and electric supply, in the center of the machine, leaving outer circumference as work area.

The entire machine diameter is open and accessible for safety, loading, and maintenance.

Smooth, fast mechanical drive is offered with choice of standard rotary type air motor, fluid type motor or electric motor.

Machine assembles motors, pumps, transmissions, or any assembly requiring a combination of hand-loaded parts and automatically hopper-fed parts.

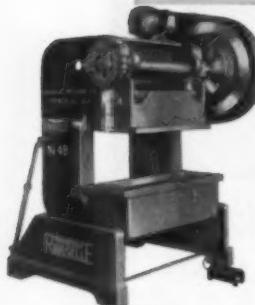
Precision Detroit Co., 20100 Sherwood, Detroit, Mich.

Use postpaid card. Circle No. 76

Elevating Feeders

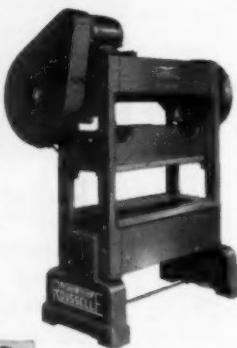
This line is designed for feeding and orienting parts of a variety of sizes, shapes, and materials to processing or

High-Output with **Rousselle** DOUBLE-CRANK PRESSES



No. 4B OBI with
"Econo-Air" clutch.

SPEED UP PRODUCTION with these versatile 40-ton presses. Large bed and ram areas make them ideally suited to handle wide rolls or sheets . . . do multiple punching, steel-rule die work and other high output operations. For rapid, shockless starting and stopping, presses can be equipped with electrically controlled "Econo-Air" friction clutch . . . Ask for new catalog.



Choice of over 30 models and types in 5 to 60-ton sizes



STRAIGHT SIDE — Die space up to 24 in.; bed space up to 6 ft. between uprights.

SERVICE MACHINE COMPANY

Mfrs. of Rousselle Presses

2310 WEST 78TH STREET • CHICAGO 20, ILLINOIS

Use postpaid card. Circle No. 370

Rousselle Presses are sold exclusively through Leading Machinery Dealers.



assembly machinery. It can effect discharge to the right or left at desired heights.

The drive is either fixed or variable speed and can be equipped with automatic controls for "demand feeding," feeder operating only when parts are needed.

Standard sizes of 6, 12 and 20 cu. ft. holding capacity are offered.

Detroit Power Screwdriver Co., 2801 W. Fort St., Detroit 16, Mich.

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how to trap dust

*that damages
your machines
and hurts
company morale*

Easy-to-move

TORIT

dust collectors trap dust
at its source!



Untrapped dust costs money: "secretly" forces precision machines out of line, limits production. Torit dust collectors are unitized for custom installation—save more money, usually more efficient than central (built-into-building) system. Torit unit operates only when machine or combination of machines it protects are on. Filtered air may be returned to room to save heat. Many models and sizes, all self-contained, easy to move. Write today to . . . Dept. 601.

TORIT

manufacturing co.

1133 Rankin Street, St. Paul 16, Minn.

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Miniature Cutting Tools

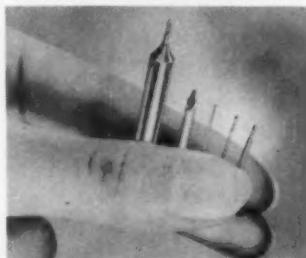
Five different high-speed steel cutting tools are displayed between a girl's thumb and forefinger. From left to right, they are: a two-flute, single-end end mill; a radial type center drill; a straight-shank, straight-fluted, wire gage size chucking reamer; a micro twist drill, and a spiral pivot micro twist drill.

The twist drills are available in millimeter sizes, .15 mm. (.0059") through .50 mm. (.0197") in both right- and left-hand cut. Pivot drill sizes range from .10 mm. (.0039") through .40 mm. (.0157"). All pivot drills have 1.00 mm. (.0394") diameter shanks.

Center drills (combined drill and countersink) are now standard with the company in sizes 00 and 0. The 00 size has a .025" drill dia. and 5/64" body dia. The 0 size has a 1/32" drill dia. and 1/8" body diameter.

Straight-shank, straight-fluted reamers are now also a regular stock item in wire gage sizes 61 through 80 and

in two fractional sizes, 1/64" and 1/32". Tolerance is +.0002, -.0000. These reamers have two or three flutes depending on the particular size involved. A full set of 20 reamers, sizes 61-80,



is also available in a metal container.

Miniature end mills are standard in 11 different styles—a total of 77 sizes. Size range is from 1/32" through 3/16" by 64ths. Style selection in single-end, double-end and ball-end all have 3/16" shanks. They are ground from the solid and have radial back-off.

The DoAll Co., Des Plaines, Ill.
Use postpaid card. Circle No. 78

More Milling Possible . . . Milling More Profitable With FUTURMILL and a handful of carbide blades



1. Lower cost metal removal. Futurmill takes the burden out of milling with inexpensive indexable carbide blades. No need to remove the cutter from the machine . . . no more cutter grinding and no more delays and lost production time. Index a Futurmill quickly and accurately, right on the machine.

2. Plenty of muscle for any job. The cutter body is a solid one piece construction of heat treated alloy steel . . . not only the most rigid cutter built . . . but precision built.

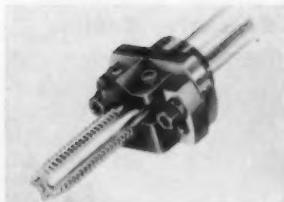
3. Protection for the cutter body. The case hardened wedges behind the blades absorb the damage in case of an accident and save the cutter body . . . cutting down expense and lost production time for cutter repair or replacement.

4. Unobstructed chip clearance. Huge chip pockets in front of the blades direct the chips out and away from the cut—critical on steel applications and on deep cuts.



FUTURMILL, INC. / 6360 Highland Road • Pontiac, Michigan

Use postpaid card. Circle No. 372



Eliminates bushings.

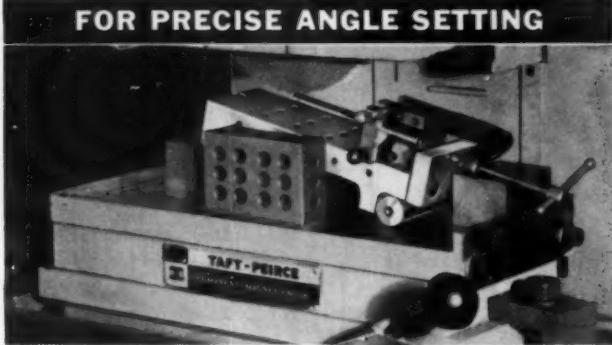
Use postpaid card. Circle No. 79

Non-Releasing Tap Holder

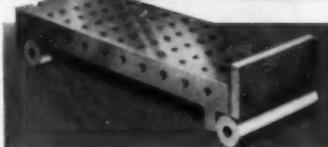
A new V-jaw tap holder is said to permit faster, easier screw machine set-ups while eliminating bushings and reducing tool inventory. Accommodating either extended or close-held taps, the new slip-in holder is reported to offer automatic, axially-perfect tool alignment. It also eliminates cutting off tap shanks. Locking assembly of the holder keeps tap held securely. Due to the adjustable V-jaw, each tap holder unit services a wide range of tap sizes; special shanks available.

Brookfield, Inc., Stoughton, Mass.

FOR PRECISE ANGLE SETTING



... USE
TAFT-PEIRCE
SINE BLOCKS



Use Taft-Peirce Sine Blocks to set work to precise angles for layout, light machining, and inspection. No angular scale to read — just elevate the sine block to the desired angle by placing gage blocks under one roll.

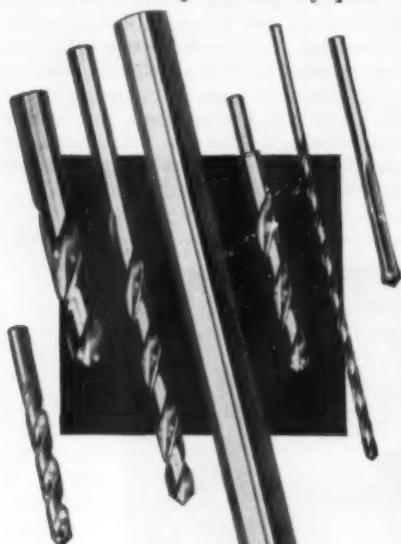
Available in 5", 10", and 20" sizes, each with end stop and tapped holes for applying work clamps. For information, including set-up instructions and setting constants, ask for Catalog 511.

TAKE IT TO TAFT-PEIRCE 

7 MECHANIC AVENUE, WOONSOCKET, RHODE ISLAND

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*Toughest, hardest, strongest
... none finer at any price!*



It pays to specify

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**DRILLS
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BLANKS**

Premium Quality High Speed Steel
Carbide Tipped and Solid Carbide

Call your local distributor today—or write Ace
direct for latest catalog and price information.

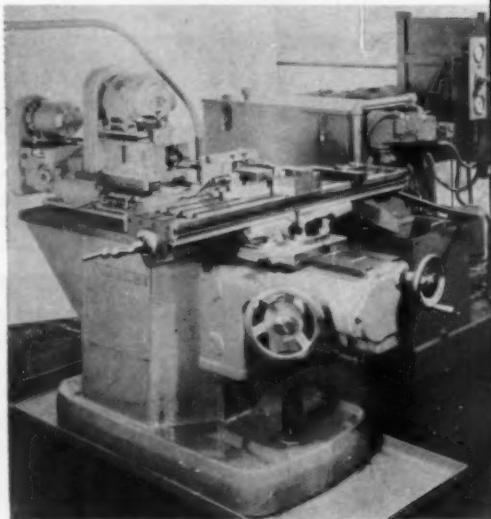


ACE DRILL
Adrian, Michigan

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

Use postpaid card. Circle No. 374

Deep Hole Driller Eliminates Need For Expensive Tooling



1/8" to 1" cap., 12" or 24" feed stroke.

A new deep hole drilling machine, revolving drill type, uses the built-in advantages of rapid work-positioning and simplified tooling possible with knee type construction. This machine eliminates the need for expensive and cumbersome fixtures normally required for accurate location of holes.

Capacities are provided from 1/8" to 1" with a 12" or 24" feed stroke; spindle speeds and feed rates suitable for a wide range of work, and rapid advance and return. Other advantages the manufacturer points out include vertical and longitudinal positioning with calibrated handwheel and crank to one-thousandths of an inch; 28" longitudinal, 12" transverse and 12" vertical travel, and a high pressure coolant unit.

The zero setting gage permits speedy, accurate location of the table and work-holding device in relation to the axis of the drill spindle.

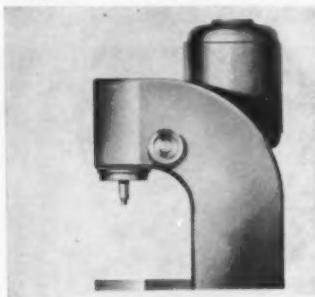
Optional, extra-cost equipment and special fixturing and accessories are also available.

Brown & Sharpe Mfg. Co., Providence 1.

Use postpaid card. Circle No. 80

**Portable Press Has
Unlimited Throat Dimension**

The E.J.S. portable press has a 4" stroke, 1" ram, and 5½" throat. Pressure range is 50 to 1500 lb. Weighing 150 lb., press is complete with built-in



hydraulic power unit and ¾ hp motor. It plugs into any convenient 110 volt, 60 cycle current outlet; other electrical ratings available.

For high production applications, it is provided with automatic control features to synchronize with any machine tool or production line. Press is also available with hand lever, push button or foot controls.

To provide unlimited throat dimension, the press is supplied without base.

Ideal for small assembly work and fabricating jobs.

John S. Barnes Corp., 315 South Madison St., Rockford, Ill.

Use postpaid card. Circle No. 81

Solenoid Valve



This Norgren Series A packless solenoid valve is two-way normally closed for ½" and ¼" pipe. Featured is flow control. The valve is designed for use with air, water, oils, and gases.

C. A. Norgren Co., 3400 S. Elati St., Englewood, Colo.

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Cooley

ELECTRIC

HEAT TREATING

FURNACES

41 Models—with and without

Controlled Atmosphere

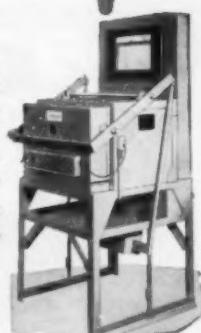
RECIRCULATING OVENS

for drying, baking, etc. 3 Types—
650° F., 850° F.,
and 1000° F. Wide
range of sizes.



INDUSTRIAL BOX FURNACE

for general heat treating to 2000°F.
Highly efficient with low maintenance;
quick repair with small down time;
sturdy, reliable.



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complete information on these and the

- New GA Atmosphere Box Furnace
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ELECTRIC MFG. CORP.

36 S. SHELBY ST.
INDIANAPOLIS 7, INDIANA

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Satisfied?

that it's PARALLEL?

. . . STRAIGHT?

. . . SQUARE? . . . FLAT?



You will be if you use "Milwaukee" Precision Equipment—Surface Plates, Straight Edges, Angles, Box Parallels. Standard of the industry!



Engineers & Machinists Since 1907
165 S. BARCLAY AVE. MILWAUKEE 4, WIS.
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Fisher Benders



A simple, sturdy machine designed to do its work in the easiest way, this bender is made of best quality malleable iron castings and has a hardened steel bending blade.

Capacity: 7/16" square or round iron

2" x 1/2" channel iron

2-1/4" x 5/16" flat iron

Catalog sheets on complete line of metalworking tools and accessories available.

T. H. LEWTHWAITE MACHINE CO.

312 East 47th St. New York 17, N.Y.

Use postpaid card. Circle No. 377

Metal Cut-Off Saw

Comet Model MF metal cut-off saw shown is powered by a 10 hp, 3 phase, 220 volt motor, belted to a four gear transmission. Its application is to cut non-ferrous tubing for a Los Angeles tube sales company.

The saw is operated by a four-way foot control valve which releases the hydraulic pneumatic feed system and



Unit is shown cutting barstock. This is cut at the rate up to 2 1/2" per second, leaving a micro finish of approximately 80.

closes the vises, actuates the saw on the rigid arm in a forward motion and upon the release of the foot valve, returns the saw to the starting position and releases the vises. The quality of the cuts depends on the geometry of the blade and the rate of feed which is adjustable.

The model can also be adapted with abrasive wheels for cutting steels and some of the exotic metals, such as Inconel.

This unit is equipped with a Norgen spray mist system and can be also equipped with a flow coolant system depending upon the needs of the customer.

Other units manufactured are currently being used in aircraft, subcontractors, machine shops, and are holding tolerances reported as $\pm .002$.

and ten minutes on the angle. The quality of the cut is in direct ratio to the speed of the feed and the type of blade used on the machine. Units are equipped usually with a 12" or 14" blade. The requirements of the user determine the specifications.

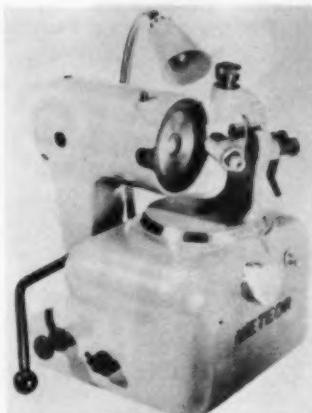
Comet Mfg. Co., 2033 Santa Fe Ave., Los Angeles 21, Calif.

Use postpaid card. Circle No. 83

Grinder Accepts Drills 6 1/4" Long, .236" in Dia.

The new Swiss-made KBS-6 Meteor twist drill grinding machine was designed for sharpening milling cutters and right- and left-hand twist drills from .008" to .236" in diameter and up to 6 1/4" long. Models for larger drills are also available. The easily-operated unit measures 13" x 10" x 15 1/2" and weighs only 37 1/2 lb.

Standard equipment includes a 20-power magnifying glass, a dressing diamond adjustable side stop for flat drill grinding, grinding ring, and lamp. Op-



tional accessories include special collets for sharpening center drills up to 7/16" in diameter and diamond grinding wheels for sharpening carbide tools.

Price is \$486.50 f.o.b. N.Y.

Associated American Winding Machinery, Inc., 750 St. Ann's Ave., N.Y. 56.

Use postpaid card. Circle No. 84

NEW FOR 1960

- NEW Improved Design
- Increased Durability
- 1" Shorter Over-All Height
- Full Adjustment for Wear

A Boring Head That Won't Face—is Obsolete

Boring, Facing, Grooving, Turning, All in One Toolhead—"As it should be."

• SIX SIZES AVAILABLE •

For complete details, write to:

CHANDLER TOOL CO. • Muncie, Ind.



MODEL "D" 1960

Chandler-Duplex

COMBINED BORING AND FACING TOOLHEADS

Use postpaid card. Circle No. 378

**Air Staker Combines
Arbor Press, Staking Functions**



Fast assembly of small components.

Basically an arbor press with a staking feature, the new Cramer air

staker performs pressing or staking operations independently, or combines them in rapid sequence. The result reported is faster, lower-cost assembly of small components such as cams, bushings, gears, shafts, posts and plates.

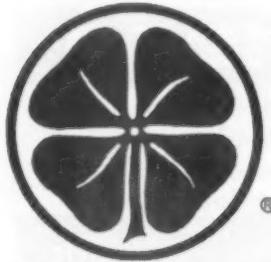
Die-set accuracy is achieved because fit of the tools is within .001 and the platen is machined square to the work line. Staking is accomplished by the impact of a tool steel piston rod inside the arbor press ram, which serves as an air cylinder.

Force of the staking blow is adjustable by a pressure regulator on the air valve, from 15 psi to line pressure.

Operator fatigue is eliminated in heavy pressing operations where considerable force would be required on the arbor press lever. Pressing is done with a hand lever.

Cramer Controls Corp., Centerbrook, Connecticut.

Use postpaid card. Circle No. 85



TESTS with CLOVER LAPPING COMPOUND

Machine lapping is always important—no one uses the process unless it is. And, as makers of the first commercial abrasive compound, Clover knows that the kind of lapping compound you use can make a vast difference in efficiency as well as in finish.

Only testing can prove out the best combination of lap speed, grain, vehicle and pressure. But one thing is sure: you might as well have Clover's 50 years of tests behind you when you start your own.

Check with Clover on lapping and grinding problems. The hardest lapping jobs often respond to an answer that was worked out for something entirely different. Use Clover's experience for a starter—write for suggestions and samples.

Clover Manufacturing Company
Norwalk, Connecticut

Victor 7-4515

We also make CLOVER COATED ABRASIVES

Use postpaid card. Circle No. 379

Cut-Off Saw Permits .003" Tolerances

Navkut saw is said to permit .003" tolerances to be held by an unskilled operator. Alignment of blade and spindle is held to .001" tolerance in all planes. The manufacturer also states ferrous and non-ferrous metals, plastics, and wood are cut with excellent finish and minimum burr, making the saw an ideal cut-off tool for small shops. Larger shops use it as auxiliary for job work to save breaking into production runs on automatics. Priced below \$300.

Navan Products, Inc., 900 N. Sepulveda, El Segundo, Calif.



Saw's spindle and vise are integral parts of the same casting.

Use postpaid card. Circle No. 86



Adaptable to all makes of drills—air and electric

Simple, rugged construction—designed for many years of trouble-free service

Versatile—its compact size makes it suitable for many different applications

Reaming and tapping time and costs can be slashed with the new BUX

OPERATES IN ANY POSITION WITH NEW RADIAL POSITIONER ➤

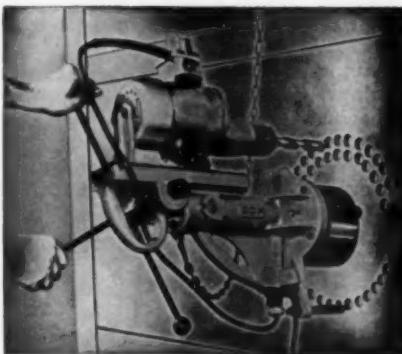
does the job of a \$16,000 Radial Drill!

CAPACITY (AT LOW COST) MAGNETIC BASE RADIAL DRILL PRESS

YET COMPLETELY PORTABLE!

SAVES ON

- MAN HOURS
- SET UP TIME
- MATERIAL HANDLING



BUX magnetic products

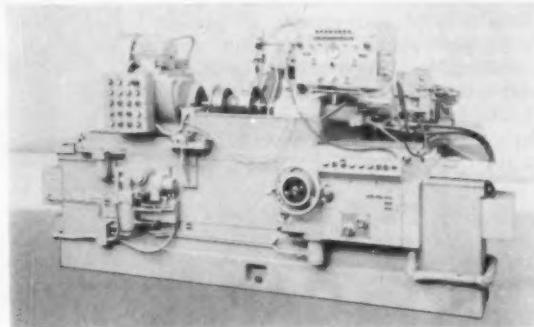
1355 NORTH TENTH STREET

SAN JOSE, CALIFORNIA

Use postpaid card. Circle No. 380

BUCK MFG. CO.

Grinder Combines O.D. and Shoulder Grinding In Automatic Cycle



Angular wheel slide grinder combines O.D. and shoulder grinding for extreme accuracy and excellent finish required for oil seal and thrust bearing seats.

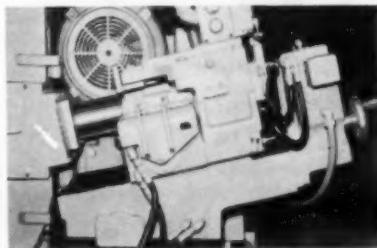
The new Cincinnati Filmatic semi-automatic angular wheel slide grinding machines, built in 6"R and 10"L, and 10"R and 14"L sizes, are designed to combine O.D. and shoulder grinding in a single, fast, automatic cycle. Typical applications include crankshafts, steering knuckles, gear blanks with hubs, etc., with critical flanges, tapers, and shoulders. Built to feed at either 30° or 45°, these machines are reported to make it easy to obtain a superior circular line finish instead of a criss-cross finish.

Automatic behind-the-wheel profile truing provides fast, accurate grinding wheel truing with provisions for two to ten passes with or without diamond advance on the last pass. The manufacturer also states it may be set to true after a predetermined number of pieces have been ground.

Standard features reported include automatic grinding wheel balancing, equipping with self-adjusting Filmatic bearings, and hydraulic motor drive of infeed screw, which provides sizing adjustments as fine as .00005" on work diameter.

Operator convenience is a feature with the automatic infeed cycle. When the grinder is set for automatic operation, pressing wheelhead advance but-

ton initiates an automatic cycle that hydraulically clamps the table, rapidly advances the wheelhead, starts work rotation, grinds at fast feed rate, grinds



Behind-the-wheel profile truing provides automatic, accurate, cam-controlled, grinding wheel truing.

at slow feed rate, taries, rapidly returns the wheelhead, stops work rotation, and unclamps table.

Optional equipment includes the automatic air-electric gage sizing with a cycle time stabilizer, also an automatic gap eliminator.

Cincinnati Milling's Grinding Machine Division, Cincinnati 9.

Use postpaid card. Circle No. 87

High-Speed Precision Lathe Features One-Motion Control

The 60 Series high-speed precision lathe features "one-motion control." The use of a single lever reduces spin-

WRITE Peaslee FOR

PRECISION

PRODUCTION RUNS OF

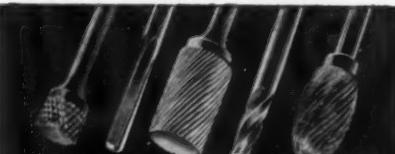
TAPER PINS

DIAS. 9/0 to #4

As specialists in stainless-steel, instrument-type pins, we offer quantity runs of standard size Taper Pins. Tolerances are held to .001 on dia. Sizes run from #4 down to 9/0. Send your blueprints for prompt quotation.

THE PEASLEE METAL PRODUCTS INC.
470 Tolland St. • East Hartford 8, Conn.

Use postpaid card. Circle No. 381



save 20 to 30% on new
CARBIDE TOOLS

RICO has a complete line of:

- Quality rotary carbide & HSS tools
- Available for immediate delivery
- Big savings on new tool costs
- Up to 50% savings on regrinds
- Special tools to specifications
- Distributor inquiries invited about better profit margins with RICO TOOLS.

Attach ad to your letterhead for more information.

RICO TOOL CO.

5915 DIXIE HWY. • SAGINAW, MICH.



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June, 1960

WILSON

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CLOSER



STEP UP PRODUCTION 20% +

... for most lathes to 1" bar stock capacity

- Hold delicate parts without damage or adjustment
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- No adjusting for stock or part variations
- Finger-tip or foot control eliminates operator fatigue
- Eliminates jarring of head stock

(Ten day FREE TRIAL to reliable firms)

WILSON AIR COLLET CLOSER, INC.
909 40th Ave. NE, Minneapolis 21, Minn.

Use postpaid card. Circle No. 383



OFFSET BORING HEADS

UNPARALLELED

- ACCURACY
- RIGIDITY
- SIMPLICITY
- DURABILITY

REPEAT TO .0001"
IN 30 SECONDS
WITHOUT BACKLASH
CAN BE ADAPTED
TO FIT ANY
MACHINE



100% GUARANTEED! WRITE FOR CATALOG!

PRECISION

PRECISION TOOL & MFG. CO. OF ILLINOIS
1305 SOUTH LARAMIE AVE. CICERO 50, ILL.

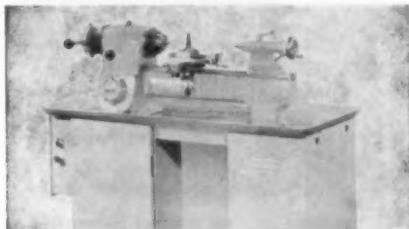
MTBB-68

Use postpaid card. Circle No. 384

239

dle control time and increases productive time. This lever starts spindle and selects any speed within a range up to 4800 rpm. It changes speeds, stops or reverses spindle. Stops may be set for repeating selected speeds on duplicate work.

The double-bevel bed positively cen-



ters tailstock in alignment with headstock. Dovetail aligns compound slide rest and evenly distributes its bearing on top of bedway as tool pressure pulls against inverted dovetail.

Large diameter super-precision ball

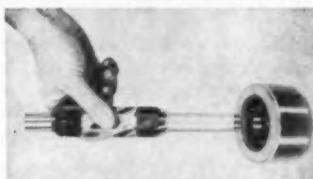
bearings fitted to in-line ground mountings are said to assure spindle true roundness and rigidity. Constant bearing preload, unchanged by speed or heat, holds spindle rigid against both side and end pressure of cutting tool.

Contrasting black markings on white dials record feed of cross slide "on diameter" and feed of compound slide in direct linear motion.

Rivett, Inc., Brighton 35, Boston.

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Superior Wearing Qualities Claimed For Ceramic Gages



Note the steel pilots which are recommended (at no extra cost) to guard against possibility of chipping ends of plug gage members.

CONCENTRIC the original,
LIVE CENTERS patented
spring loaded live centers

JAM PROOF

AUTOMATIC THRUST ADJUSTMENT
Spring loaded spindle maintains constant tail stock thrust.

LONGER LIFE
Needle bearing distributes bearing stress over greater surface, thus holding close tolerances for much longer time.

FASTER SPEEDS
Smaller turning radius gives much higher RPM rate than ordinary live centers.

GREATER LOAD CAPACITY

LESS OVERHANG MEANS MORE RIGIDITY... MORE WORKING RANGE

CONVENTIONAL LIVE CENTER CONCENTRIC

Pat No. 2,520,473

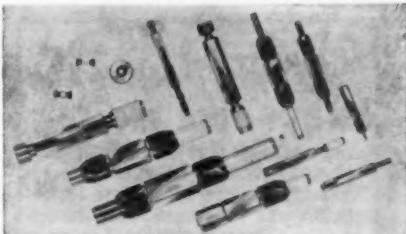
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CONCENTRIC TOOL CORP., 2486 Huntington Dr., San Marino, Calif.

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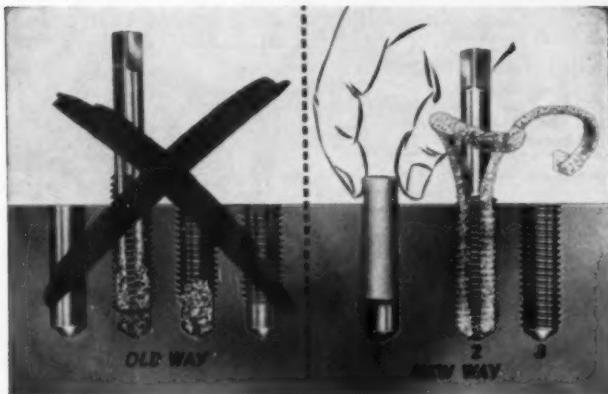
The manufacturer uses a special type of ceramic for his plain and threaded plugs and plain ring gages. It is known as high density, high purity aluminum oxide, and was chosen to give the maximum possible strength and surface finish.

Gaging with ceramic gages is said to offer no problems different from gaging with conventional steel gages, except that they are more brittle and need careful handling. Otherwise, the major



Thread plug, plain plug, and plain ring ceramic gages.

Chip problems eliminated when you tap blind holes with new TAP CARTRIDGES



Pictured on right shows (1) a tap cartridge (wax pellet) dropped into drilled hole. As tap works into hole (2) solid flow of wax carries chips along and out flutes as fast as chips are made. Bottom of hole is clean when taps get there. Result (3) a clean accurate hole.

- Tap to bottom of hole in one pass.
- Tap cleans itself on next hole.
- Eliminates rejects, torn threads, oversized holes.
- Extends tap life 3 to 5 times.
- No allowance for chip room.
- Obtain a smoother, more uniform thread.
- Can be used in steel, iron, aluminum, plastic and the newer exotic metals.

For FREE SAMPLES give tap size, threads per inch, depth of drilled hole. Sizes 0-80 thru 1 1/4". Write or phone today.

THE TAP CARTRIDGE CO. P. O. BOX 1017-T
JUNiper 1-7511 • CINCINNATI 1, OHIO

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NEW Baj ONE-PASS KEYWAY PUSH BROACH



This non-adjustable version of the Glenny Adjustable Expansion Broach (formerly produced by the East Shore Machine Co., Cleveland, Ohio) introduces these outstanding features:

- FAST, EASY OPERATION
- REPLACEABLE HIGH SPEED STEEL CUTTING BLADE
- EXCLUSIVE BODY DESIGN
- HIGH ACCURACY—to .0005 plus or minus
- LONG LIFE—up to 100,000 keyways without replacing.
- WIDE RANGE OF STANDARD SIZES

Write for Details. Exclusive Distributor Territories Open.

The Baj Tool Company

(Manufacturers of
Baj and Glenny Broaches)
19751 St. Clair Avenue
Cleveland 19, Ohio

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A CONTROLLED BLOW Saves TIME, EFFORT and MONEY

TAHLEN NO-BOUNCE HAMMERS

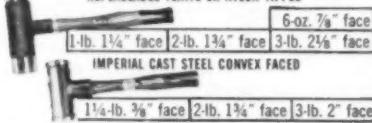
Prove, in your own plant, why this imitated, but never equalled hammer has saved millions of man-hours for its users.

Plastic tipped TAHLENS have all the advantages of lead hammers but none of their faults. No flying fragments, no distorted faces that cause misplaced blows.

And for fastening and drilling, Cast Steel TAHLENS with their high impact, replace mauls twice as heavy—save time and energy.

CONTROLLED BLOW PROFITS are yours with TAHLENS

REPLACEABLE TETRITE OR NYLON TIPPED



Write for the Tahlen distributor in your area
Dept. M6 **TAHLEN HAMMER CO.**
1729 1st South, Seattle 4, Washington

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advantage reported is that they are superior in wearing qualities to either steels or carbides.

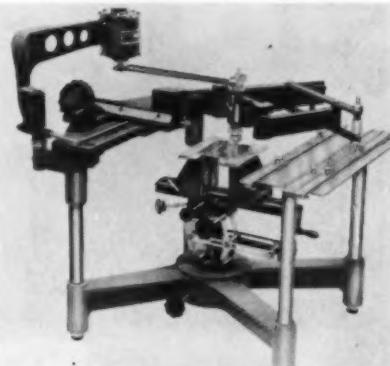
In addition, the company states advantageous comparisons are shown in high abrasion resistance, low coefficient of friction, and non-corrosive and non-magnetic properties.

Types available include thread plug gages, No. 6 through 1 1/2"; plain plug gages, .100 through 1 1/2"; plain ring gages, .070 through 1 1/2", and plain master discs, .105 through 1 1/2". Sizes smaller or larger, and specials, upon order.

Greenfield Tap & Die Corp., Greenfield, Mass.

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Table Model Engraving Machine Cuts 1/16" In Cold Rolled Steel



Engravograph Model ITX produces precision work with unskilled labor

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G. B. LEWIS COMPANY
DEPT. MT WATERTOWN, WISCONSIN

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MACHINE and TOOL BLUE BOOK

from a master template, because of its tracer-guided feature. Stating that it features far heavier construction than previous table type engravers, the firm reports it does two kinds of jobs. As a marking tool, it makes signs and nameplates, engravings names and numbers on parts, tools, etc. As a production tool, it saves man hours and costs by doing jobs requiring slotting, profiling, and milling.

Some of the features reported are that the machine cuts $1/16"$ deep into cold rolled steel in one pass; $1/8"$ in non-ferrous metals; covers a $12" \times 3\frac{1}{2}"$ area in one set-up, and offers 21 different ratio settings ranging from 2:1 to 7:1. Settings can be changed in seconds without dis-assembly of any kind.

New Hermes Engraving Machine Corp., 154 W. 14th St., New York 11.

Use postpaid card. Circle No. 91

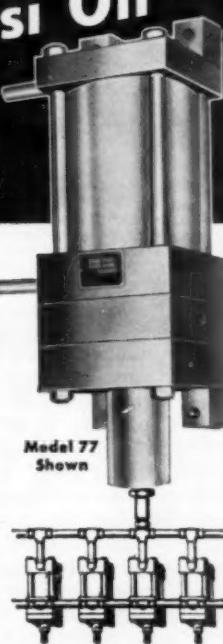
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Model 77 Shown



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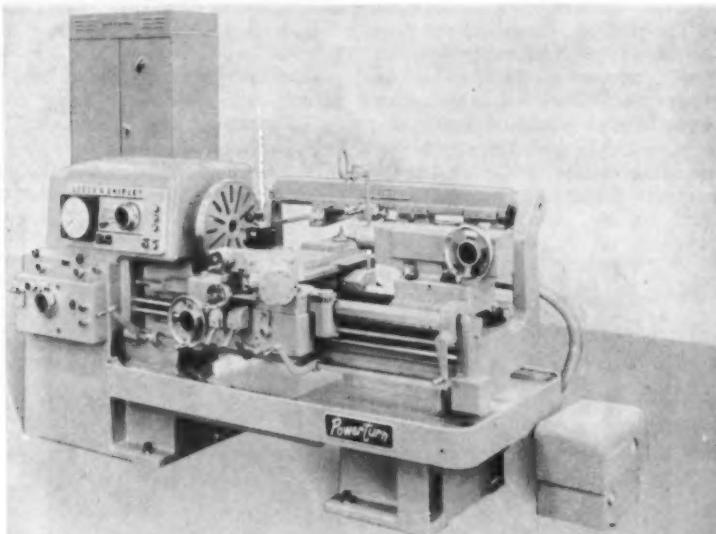
Miller FLUID POWER DIVISION
Flick Reedy Corp.
7N022 York Road Bensenville, Ill.

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June, 1960

243

Constant Cutting Speed Lathe



2013 Powerturn 45° Copymatic lathe (30" between centers). Unit at right end of lathe is Copymatic hydraulic system reservoir, filter, pump, and motor unit. Cabinet behind left end of lathe is variable speed control for DC drive motor. This lathe also is equipped with special cross slide extension for cross-center facing and automatic reversing controls for spindle and feed.

A new universal constant cutting speed lathe that eliminates the need for speed control cams and computations has been announced. Built in Powerturn 45° Copymatic models in sizes from 2013 to 3220-37, the new lathe provides constant cutting speed at any point, regardless of contours. The manufacturer also states that the machine eliminates the cost and delay of providing a special speed control cam for each job, gives longer tool life and minimizes tool grinding.

The lathe headstock is equipped with a 24-speed transmission plus a variable speed drive which permits infinitely variable control of each speed, with automatic and/or manual speed control. Even in automatic operation, the operator can, through a conveniently-mounted dial, manually "trim" the spindle speed.

This machine, with an operation tech-

nique Lodge & Shipley calls "combined feeds," is said to make possible machining capacities substantially greater than on conventional tracer lathes. As a typical example, a 26" diameter hemisphere, machined by conventional tracing, would require 18- $\frac{1}{2}$ " of cylinder stroke, which is impractical. This is unnecessary, it is stated, for "combined feeds" engages longitudinal and cross feed simultaneously to give a straight tool path in a line which might be termed a "mean" of the contour. Then, the hydraulic cylinder needs to provide only for the differences from this path to the actual contour being machined.

Elaborating on "combined feeds," Lodge & Shipley points out that conventional cross feed and longitudinal feed (in a 1:1 ratio) gives a tool path at 45° to the centerline. In extreme cases, longitudinal and cross feed ratio

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June, 1960

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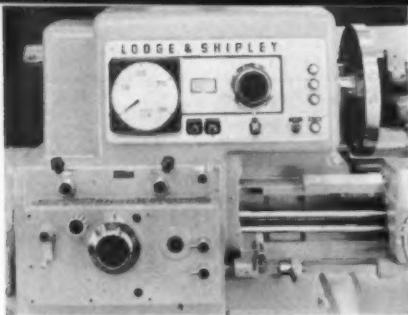
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Plants: Beaver Falls, Pa., Hammond, Ind.

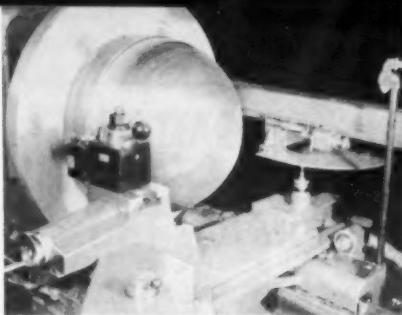
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Constant cutting speed lathe control. This lathe is equipped with special three-speed mechanical shift headstock and a 20:1 variable speed drive. The three mechanical shift speed ranges are: 4.7 to 93, 21.6 to 431, and 100 to 2,000 rpm.

can be increased to provide a resultant tool path at 10° or even 5° to the centerline. Such ratios are ideal for venturi shapes, nozzles and other long, slender workpieces with relatively large diameter changes.

Other new features include: End gearing to permit reduced feed rates for extremely critical surface finishes; a cross-center facing arrangement that automatically brakes and stops the spindle as the tool reaches the centerline,



Turning a 26" diameter hemisphere on a 3220-32 Powerturn lathe.

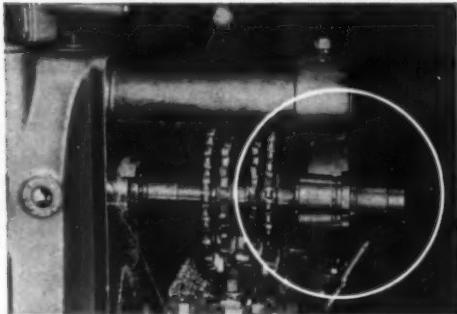
reverses and restarts spindle rotation. At the same time, feed direction is reversed and the tool continues feeding to the back side of center, all under tracer control. A special swivel arrangement permits mounting of an integral type spindle for contour grinding.

In addition to the special equipment mentioned, each lathe is fully equipped as a 45° Copymatic lathe and can be used as a standard tracing lathe at any time.

The Lodge & Shipley Co., 3055 Cole-rain Ave., Cincinnati 25, Ohio.

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Replace the bronze bushing in your MILLING MACHINE ARBOR SUPPORT with a Sonnet ROLLER BEARING



Installed in minutes without machine rework. Requires no extra space; no adjustments. Extra sets of bushings provided to accommodate different size arbors. Permits full range of speeds and feeds of late model milling machines. Carbide cutters can be fully utilized.

- Faster speeds and feeds
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TOOL & MFG. CO.
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Hawthorne, California

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MACHINE and TOOL BLUE BOOK

Bed Type Milling Machines Have Hydro-Mechanical Table Drive

Rigidity for heavy climb or conventional cuts plus flexibility for production or short runs are the strong features claimed for the new 100 and 200 Series Hypowermatic bed type milling machines. Heavily proportioned components, together with Cincinnati's new hydro-mechanical anti-backlash rack-and-pinion table drive and Dynapoise over-arm vibration damping are

said to permit chatterless machining at exceptionally high metal removal rates.

These mills are available in plain or duplex models, and can be furnished with either automatic rise-and-fall spindle carriers or with tracer-control of spindle carriers. Table widths are 12" for the 100 Series and 15" for the 200 Series. 12" tables are available in four lengths from 59" to 83" and 15" tables come in four lengths from 71" to 107". Feed rates are infinitely vari-

Machine part broken?

... make a new one fast with

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steel bars . . for maintenance

- STRESSPROOF needs no heat treating!
- Available in sizes up to 4" rounds.
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- It costs less than heat treated in-the-bar alloys.
- You can make most of your parts from just one stock of STRESSPROOF.

Ask for 24-page booklet, "How to make your own machine and repair parts quicker and easier."

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1480 150th Street, Hammond, Indiana

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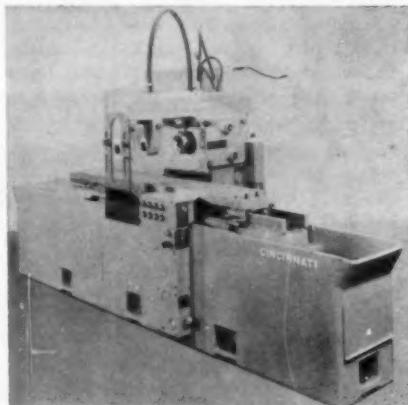
**QUEEN CITY
MACHINE TOOL CO.**

3912 Kellogg Ave.
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able from 1" to 150" per minute. Rapid rate is 300" per minute.

All spindles have 16 speeds with speed changes by means of pick-off gears. Standard spindle for the 100 Series Hypowermatic is 7½ hp with a range of 40-1600 rpm; a 5 hp spindle with 30-1200



Plain machine with tracer.

rpm range is optional. For the 200 Series 10 hp with 50-2000 rpm is standard, 7½ hp with 30-1200 rpm is optional and 15 hp with a speed range from 75-3000 rpm is available at extra cost.

Rise-and-fall and tracer-controlled Hypowermatics are equipped with Cincinnati's new Telematic control, a "peg-board" automatic control concept which allows the operator to program all machine functions for automatic cycles



NEW! Self-Centering 5C Collet Stop

Quick friction adjustment. Stays in fixed position. Will not distort collet. Will not move back. Also available for other collets and spindles. 30 Days Free Trial. Several Territories Open for Distributors

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THE BYSTROM COMPANY
6105 Park Ave. South Minneapolis 17, Minn.

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MACHINE and TOOL BLUE BOOK

in proper sequence by placing small pegs in holes of a peg-board.

Machine controls are conveniently and compactly located at the front right of the bed. A selector switch is provided to start and stop spindle. Feed rates from 1" to 150" can be selected quickly, with a single infinitely variable selector dial.

Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

Use postage paid card. Circle No. 93

Improved Model of Vibratron

A new, improved model of the Roto-Finish Vibratron is reported to eliminate the need for manual loading and unloading of parts and media.

A built-in, removable, double-decked vibrating separator in the base of the machine separates parts and media, as well as fragments from the media, in one simple operation. There is no need for an extra separator.



Unit has removable vibrating separator.

Primarily designed to finish complex cast, forged, stamped, and machined parts with hard-to-reach shielded and internal surfaces, the machine uses very short time cycles.

Roto-Finish Co., 3700 Milham Rd.
P.O. Box 988 Kalamazoo, Mich.

Use postage paid card. Circle No. 24

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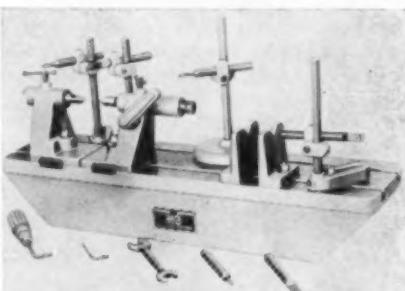
TRAINING for INDUSTRY DIVISION
WHEATON, ILLINOIS

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Bench Center and Surface Plate

The Model BC3 bench center and surface plate provides for accurately inspecting all types of work. Work-pieces can be mounted between centers, in V-rests, or on precision ground surface plate. Runout is shown on the dial indicator as work is rotated by hand. Side runout or camming action can be checked with a second indicator. Parts without centers can be checked with the V-rests, furnished as standard equipment.

Rigidly mounted tailstocks can be



Work can be mounted between centers, in V-rests, or on surface plate.

positioned any place on the T-slot. Centers are alloy steel, hardened and precision ground. Carbide centers are available at extra cost.

Four indicator stands are standard with the unit. Dial indicators are not furnished with this unit.

Specifications include: Distance between centers, 22"; centerline height from centers to plate, 4.130"; dia. of work over surface plate, 8 $\frac{1}{4}$ ", and length of base, 28".

K. O. Lee Co., Aberdeen, S.D.

Use postpaid card. Circle No. 96

Change in Model A-6 Horizontal Band Saw

The Model A-6 horizontal metal cutting band saw is now being built with a specially designed welded band frame and band cover to replace the cast type



formerly used. The new unit is said to provide a much more rigid and stronger

machine. The appearance of the cutting head has been modernized similar to the firm's larger machines.

This model has a cutting capacity of 6" x 10", uses a 94" x 1/2" x .025" blade, 1/3 hp motor, blade speeds of 60, 90, and 120 fpm.

A quick-action vise can be turned 45° for angle cutting, with a capacity of 5" x 6".

W. F. Wells & Sons, Inc., Three Rivers, Mich.

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HAND WHEELS • MACHINE HANDLES



HAND WHEELS

Best quality, fine grain cast iron. Rim and handles polished to high luster. Handles are revolving, solid or omitted. Available in standard sizes 4" to 12" dia. with plating, broaching or other machining to your specification.



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Revolving handles turn on HARDENERED steel spindle with permanent graphite grease lubrication permitting FASTER, EASIER adjustment by user. Machined from quality BAR STEEL ground and POLISHED to a smooth, high luster.



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KENTRALL Hardness Testers Are Motorized

By removing major test loads automatically, the new motorized Kentralls reduce operator error, increase reproducibility of test results, and raise the productive capacity of the machine—for the same price as hand operated testers.

The motorized Kentralls are available in Combination Testers which provide both Regular and Superficial Rockwell Hardness Testing in a single machine. For those applications that do not require the additional range, Kentrall also makes single purpose testers for either Regular or Superficial testing alone.

For complete information write for Bulletin CRS-60.

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TG-164

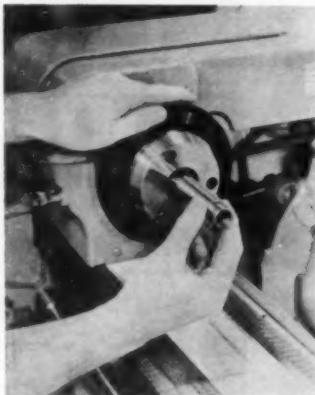
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252

Chuck Has Range of .100" In Which to Chuck Any Dia. Bar

A new development in collet chucks for lathes, the Model 50, has a hand-wheel-operated, nose-type closure and "Rubber-Flex" collets.

The manufacturer claims his collet chuck offers easier, faster collet changing, capacity increases up to 42%, and



Chuck grips work easily due to hand wheel design and collet range.

a maximum runout of .001" at the nose. Bar capacity is from .100" to 1.063", with a chucking range of .100". It is also reported that tremendous gripping power is provided for heavy duty turning.

The new model can be used to chuck tubing and fragile materials and also hold round pieces on drill press tables,

JIG GRINDING and JIG BORING

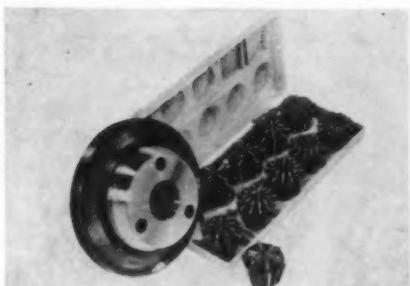
to your specification

At your disposal: Our sub-contract jig boring department, one of the best equipped in the East.

A. K. TOOL CO., INC.
ROUTE 22, MOUNTAINSIDE, N.J.
Telephone: ADams 2-7200

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MACHINE and TOOL BLUE BOOK



Chuck and set of ten "Rubber-Flex" collets.

milling machine tables, and magnetic chucks.

The chuck and a set of ten collets retails for \$135.00.

Jacobs Mfg. Co., West Hartford 10.
Use postpaid card. Circle No. 88

Punch & Die Maker Features Tilting Stroke Mechanism

The new Rice-Milwaukee Model PDM punch and die maker features tilting stroke mechanism, tilting table, infinitely variable speeds and strokes.

how fast are you performing secondary operations on parts like these?



Headed aluminum, tap #8
—32 holes, 5200 per hour.



Extruded brass, drill and
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Operations performed by Universal— Automatic machines and systems (Our capacity .020—3.8)

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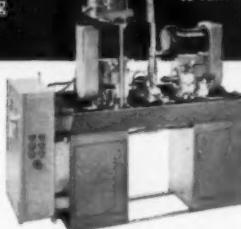
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Rivet Drilling & Tapping



Brass bar stock, drill
two #43 holes—tap
two #4-40 holes, 2200
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Leading companies—large or small—use U-A equipment to speed up production and to lower costs on their basic secondary operations. You, too, can beat the high costs—low profit squeeze...send parts or drawings for quote.

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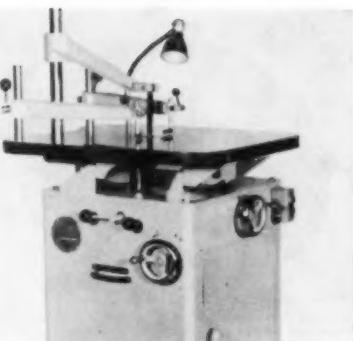
9545 Ainslie St., Schiller Park, Ill. Call collect: GLadstone 5-7720

Use postpaid card. Circle No. 406

Strokes are variable from 0 to 5"; speeds variable from 80 to 350 strokes per minute. Upper and lower arms of this heavy duty machine are power operated. The machine is designed to handle all small die making requirements.

Two table sizes are available—20"x 20" and 24"x28".

Capacities are as follows: Accommodates maximum thickness 6" with overarms; 8" without overarms. Horizontal



Machine with 24" x 28" table.

sawing and filing capacity, small and large tables—with hold-down arms in place, small table 22½", large table 27"; without hold-down arms, small table 26", large table 31"; all to center of circles have above diameters.

Rice Pump & Machine Co., Belgium, Wis.

Use postpaid card. Circle No. 99

Automatic Recessing Tool Has Interchangeable Adapter

A new type of automatic recessing tool features an interchangeable snap-on work pilot adaptor which permits piloting of the tool in the work, as well as in a fixture bushing.

The work pilot adaptor is normally used on turret lathes, automatic screw machines and other equipment where the work is rotating. The tool may pilot in a fixture bushing on machines

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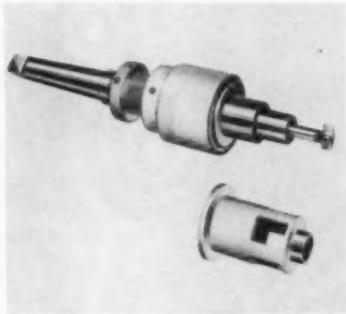
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MACHINE and TOOL BLUE BOOK

where the spindle is turning.

The new design has only one joint to effect tool accuracy and features a solid, single-bar construction which minimizes tool chattering.

Three basic types of standard tools are made for work diameters from .375" to 2.250" and a depth of cut up to .281". Cutter heads are available



to perform a wide variety of intricate operations such as relieving, grooving, forming, back facing, chamfering, counterboring and necking. Recessing cutters perform these operations singly or in combinations.

Madison Industries, Inc., P.O. 1137, Providence 1, R.I.

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Fine Adjustment of Chip Breaker Provided By Toolholder

The new Dial-A-Breaker Kindex toolholder permits fine adjustment of the chip breaker and close control of chips in machining operations. A

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June, 1960

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Provides automatic selection of proper torque wrench for adapters and/or proper adapters to go with given torque wrenches.

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RADIUS DRESSER

is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on all wheels up to 10" and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation. Price \$80.50



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THE G-2 ANGLE DRESSER AND TOOL HOLDER

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256

knurled thumb nut or "dial" on a screw provides an infinite number of chip breaker positions. The adjusting nut is readily accessible on top of the toolholder regardless of tool position.

The solid Kennametal chip breaker, to which the screw is attached, retains



its position while indexing or changing inserts.

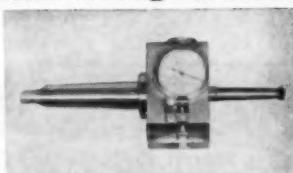
The holder is especially suitable for rear carriage positions and close ganging of tools because the chip breaker adjusting nut is on top of the tool and is exposed more than 180° for turning.

There are 70 styles and sizes of holders offered. Only two sizes of chip breakers are required for eight different sizes and styles of inserts. Each chip breaker can be used with either square or triangular inserts.

Kennametal Inc., Latrobe, Pa.

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Boring Head Provides For Precision Boring—.000050"



The Bokumicro-Dial boring head is claimed to provide a way to get precise boring—within .000050". The head is equipped with two calibrated dials. The micrometer dial, used for quick adjustments, gives direct readings as the boring head is moved. The easy-to-

MACHINE and TOOL BLUE BOOK

read, conveniently located dial indicator is used to get hair-splitting accuracy.

The indicator actually reads the cutting tool movements and compensates for backlash, thread compression and other friction moving possibilities.

The tool slide can be adjusted from zero to $\frac{1}{4}$ " off center. After the tool has been moved to its final position, it is stated that no clamping error can occur.

A gage block provided aids in centering.

Two models—one for the $\frac{3}{8}$ " and one for the $\frac{1}{2}$ " tool shanks—can be used in any vertical or horizontal boring and milling machine or any type of lathe.

Bokum Tool Co., Inc., 14775 Wilmot Road, Detroit 38.

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Coil Cradles Have New Coil Guide Arrangement

The 2000 J Series "Easy Load" coil cradles have new coil guide plates

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located forward of and above the center of the coil. This guiding system eliminates side pressure on the lower portion of the coil, which is compressed by its own weight. This is said to permit fast, accurate feeding to the press without crimping of the stock edges.

Four models are available with maximum width capacities of 10", 15", 20" and 24". They all handle stock widths from 1" wide to the maximum width

Buy safe "SHUR-GRIP"



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258



Four models offered—maximum width capacities of 10", 15", 20" and 24".

of the cradle. There is a maximum weight rating of 2,000 lb. A $\frac{1}{2}$ hp motor powers the unit.

A standard feed rate of 90' per minute is incorporated. Other feed rates are available.

Rowe Machinery & Mfg. Co., 811 Regal Row, Dallas, Texas.
Use postpaid card. Circle No. 103

Double-End Automatic Threading Machine

Fast, accurate and rugged, the Grant, Model 2TM, double-end automatic threading machines are designed to operate simultaneously on both ends of such parts as tubes, rods and spindles. Work is placed in the magazine by the

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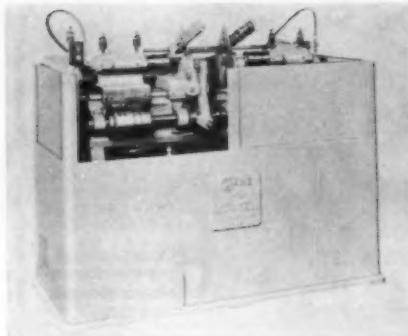
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MACHINE and TOOL BLUE BOOK



operator and drops by gravity into feed fingers. Transfer slides then convey each successive piece to a position between the clamping jaws, which firmly grip the work. The tool-heads, advanced by large drum-type cams at the front of the machine, perform their operation, withdraw, and the work is ejected. The entire machine cycle is completely automatic.

Each machine is easily adaptable to a range of diameters, lengths and number of threads per inch by simple changes in the cams, gearing, and clamp-jaw inserts, and adjustments in the magazine feed and tool-heads.

The Grant Mfg. & Machine Co., 90 Silliman Ave., Bridgeport 5, Conn.

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Portable Bar & Angle Shear

Round, square, flat and angle iron are reported to be sheared in the field with a portable bar and angle shear

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DRILLING,
TAPPING,
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FIXTURE**

Uses 3C, 1A and 5C
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June, 1960

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COOLANT SYSTEM**

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For drilling, tapping, milling, sawing, grinding, etc. Removes heat from cutting edges of tools and work. Feeds can be increased considerably, finer finishes and accuracy are obtained. TRICO-MIST absorbs heat, thereby quenching it faster than flood coolants which only transfer it. Chips slide freely up the tool face and are blown away automatically. Simple needle valve controls size and volume of mist spray. Attaches to shop air line. Available with one and five gallon containers—single or multiple outlets—single or dual valve control.

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MILWAUKEE, WIS. U.S.A.**

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Offset Type

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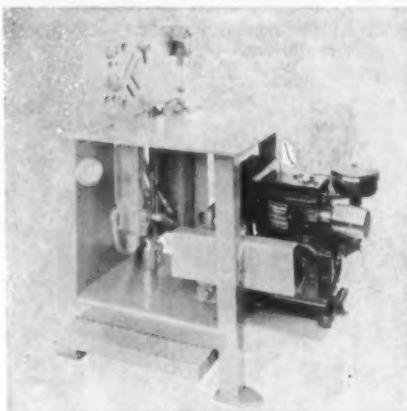
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SPECIFICATIONS
Open width $\frac{1}{2}$ " to 6"
Gage Material .040 to .125
Pin Diameter .101 to $\frac{1}{2}$ "
Lengths to 120"

OPEN

SEMI-OFFSET

which has a 5 hp, 5 cycle gasoline engine. This machine is an addition to the



Shears round, square, flat and angle iron.
line of Shearease machines manufactured by The Shearease Co.

Capacity that can be sheared is 1"

round, 1" square, $3\frac{1}{2}$ " x $\frac{3}{8}$ " flat and 4"x4"x $\frac{3}{8}$ " angle iron as well as smaller bar and angle sizes.

The self contained portable unit, weighing approximately 650 lb. is hydraulically operated with a vane pump. When necessary the blades can be re-sharpened on a surface grinder, giving the blades a life of over a million strokes. Replacement blades are interchangeable and available from stock.

The Shearease Co., P.O. Box 125, Torrance, Calif.

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Multiple Position Work Tables

A line of multiple position work tables with built-in power transfer switches has been developed for numerous induction heating applications such as, soldering, brazing, bombarding, and heat treating.

As illustrated, the set-up on the left shows a five-piece assembly being soldered in one open end coil using

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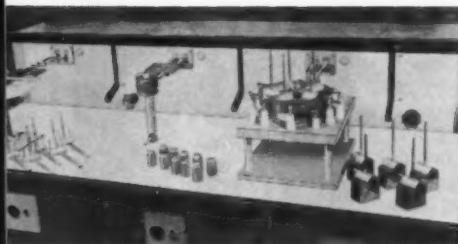
Here is the faster, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per-hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money too!

IN 11 SIZES—No. 6 to 1"
N.C. In all S.A.E. sizes.



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pre-formed solder rings; in the center, tungsten contacts are being brazed to

brass bodies using silver solder, and on the right, five copper and brass assemblies are being soldered within one heating coil. All three operations can be kept going without loss of time.

Each station can be operated by push-button, footswitch or timer.

Work tables can also be built with quench tanks for heat treating.

Lepel High Frequency Laboratories, Inc., 55th St. & 37th Ave., Woodside, New York.

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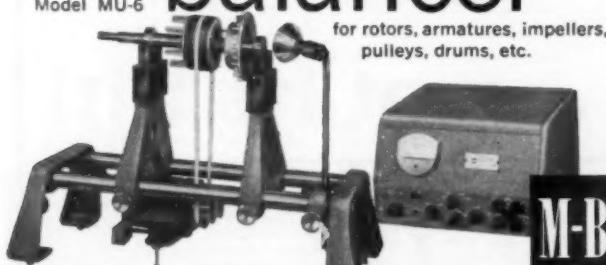
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for rotors, armatures, impellers,
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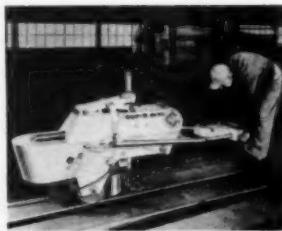
For further information write to—
MICRO BALANCING INC., Herricks Rd., Garden City Park, L. I., N. Y.
West Coast Representatives: Electronic Balancing Co., Long Beach, California

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Portable Unit Drills Up to 1½" Dia. Holes

The 730 lb. Magnetic SUP-R drill is designed for drilling heavy structural shapes and other heavy metal drilling. The portable unit drills, reams, or countersinks up to 1½" dia. holes (larger, when an adapter is used). Only one man is required for operation. Some of the special features reported include a one-ton holding magnet for positive positioning, hole accuracy, and max. drill point pressure; lowest possible center of gravity, for easy maneuvering, added safety, and full 5 hp electric motor with four-speed gear shift.

Guibert Steel Co., Pittsburgh 5.



Frequently does work assigned to radial, wall, gantry, other fixed installation drills.

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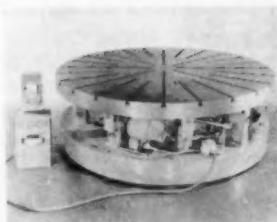
ADAMAS CARBIDE CORPORATION
KENILWORTH, NEW JERSEY

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102" Precision Horizontal Rotary Table

Claimed to be one of the largest precision horizontal rotary tables ever built, a table 102" in dia. with a bearing load capacity of 90,000 lb. has been produced. The manufacturer states this explosion proof table features an accuracy of five seconds of an arc, certified by auto-collimator reading. Preliminary rotation positioning is achieved by a visible counter reading from 000° to 359°. Final positioning is manual, with aid of a microscope. Adjusting speed motor drive is from zero to 1/3 rpm (108" per minute). Other sizes offered.

Machine Prod. Corp., 6771 E. McNichols, Detroit 12.



For inspection, machining operations.

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There's no better "insurance" against costly, premature dulling of your high speed production tools than reliable Sentry hardening. Sentry's unique Diamond Block provides a truly neutral atmosphere that permits heat treating for maximum hardness without danger of scale or decarburization . . . keeps your production tools sharper longer.



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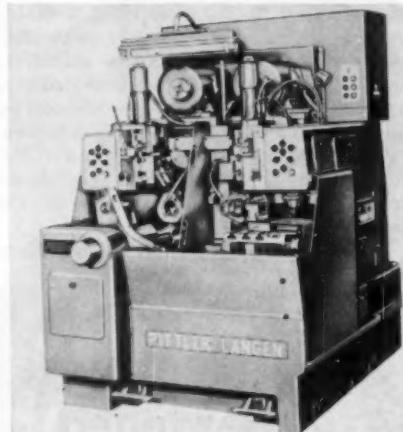
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Automatic Two Spindle Chucking Machine For Finishing Operations

The new Pittler "Pidofat" is an automatic, two spindle chucking machine for economical internal and external front operation finishing of castings, forgings, gears, wheels, flanges, bevels, etc.—on a production or even a short-run basis. The spindles are independently driven by their own 13.5 hp motors, and have eight working speeds each. The left-hand spindle is provided with a turret slide having three index positions suitable for close-tolerance boring operations. A separate program-controlled compound slide does longitudinal and transverse cutting operations of any desired contour.

The right spindle has a heavy-duty cross-slide to do internal and external turning, and a compound slide similar to that on the left spindle. This top slide, however, is suitable for operation as a fully automatic copying device. The independently adjustable feed rate remains constant in any copying direction.



A separate program-controlled compound slide does longitudinal and transverse cutting operations of any desired contour.

Proper working speeds are automatically obtained through an electro-hydraulic system, in accordance with

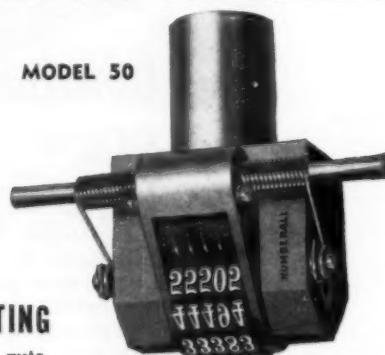
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program settings.

Idle time for positioning of cutting tools is reduced through a built-in rapid traverse device.

Maximum turning diameter, 9.1"; maximum swing, 9.5"; speed range 14-1500 rpm; feeds, .32-.16"/min.

Accessories include copying attachments, coolant pumps, a chip removal conveyor, recessing and facing attachments, etc.

A similar single-spindle machine, the "Pifat" is also available.

Cosa Corp., 405 Lexington Ave., New York 17.

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Machine Chamfers Tubing Of Various Dias. and Length

A new Acme double end deburring machine automatically chamfers the ID, OD and face of tubular steel parts of various diameters and lengths. Tubing from $\frac{3}{4}$ " to $2\frac{1}{4}$ " dia. and from $2\frac{1}{2}$ " to 24" long is reported to be deburred by

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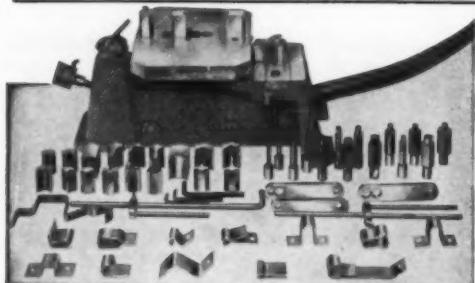
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NEW BRIGHTON, PA. (Pittsburgh District)
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June, 1960

265



Multiform BENDER CUTTER

CUTS, BENDS, PUNCHES

Available in hand, air and hydraulic models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to punch, bend, and cut round or flat brass, bronze, aluminum, steel, etc., up to $\frac{1}{4}$ " x $1\frac{1}{4}$ " as illustrated, other models up to $\frac{1}{2}$ " x 8".

J. A. RICHARDS CO.
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this machine at production rates up to 6,000 pieces per hour. Fixtures are de-

chine is completely mechanically operated.

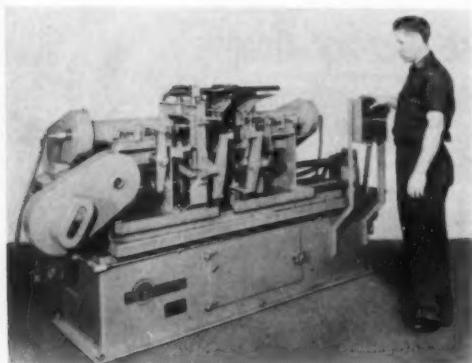
A variable speed program shift, extending the entire length of the machine, synchronizes all automatic operations.

Tubes are manually loaded into a vertical magazine in the machine to insure proper positioning. A walking beam type transfer mechanism automatically transfers the tubes from the magazine to the work station chuck jaws and ejects finished tubes from the machine.

When the tubes are clamped in the work station, drum cams drive two opposed deburring tools into each end of the tube. After deburring operations have been completed, the drum cam retracts the deburring tools, the finished tube is automatically ejected from the machine, and the next tube to be deburred is transferred to the chuck jaws by the transfer mechanism.

Acme Manufacturing Co., 1400 E. Nine Mile Rd., Detroit 20, Mich.

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A variable speed program shaft, extending the entire length of the machine, synchronizes all automatic operations. It actuates tube transfer operations, opens and closes chuck jaws, operates work spindles, etc.

signed to permit rapid tool change from one tube diameter to another. The ma-



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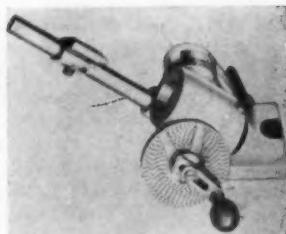
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MACHINE and TOOL BLUE BOOK

Dividing Head

This dividing head is designed for use in instrument and model shops to produce a wide variety of small precision parts with a minimum of set up time and effort. Minimum overhang is featured, as well as rigidity of height and weight which permits use readily on rotary tables, milling machines, surface grinders, etc. The spindle affords 1" capacity with the use of 5C collets, concentricity within .0002, 360° swing in a vertical plane and indexing accuracy of one minute of arc. Falcon Machine & Tool Co., 200 Concord Turnpike, Cambridge, Mass.



Featured is minimum overhang.
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Free Technical Bulletin on Surface Measurement

gives all the meat of ASA Standard B46.1-1955 on surface roughness, waviness and lay, plus helpful supplementary material. Arranged for easy reading and convenient reference. Includes these sections:

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180 AMP ARC WELDER. Dial type control provides easy, positive setting of welder output over a wide amperage range. Electrodes from the smallest to 3/16" size can be used to weld materials from 20 ga. to 1/2" or thicker plate. The unit welds mild steel, low alloy steel, and 18-8 type stainless steels. Operation is on 220 volt single phase power supply. The approximately \$145.00 price includes cables, headshield, electrode holder, ground clamp and power input connections. The Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio.



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suspension type
FLEXIBLE SHAFT MACHINE
eliminates tooling problem for I.B.M.



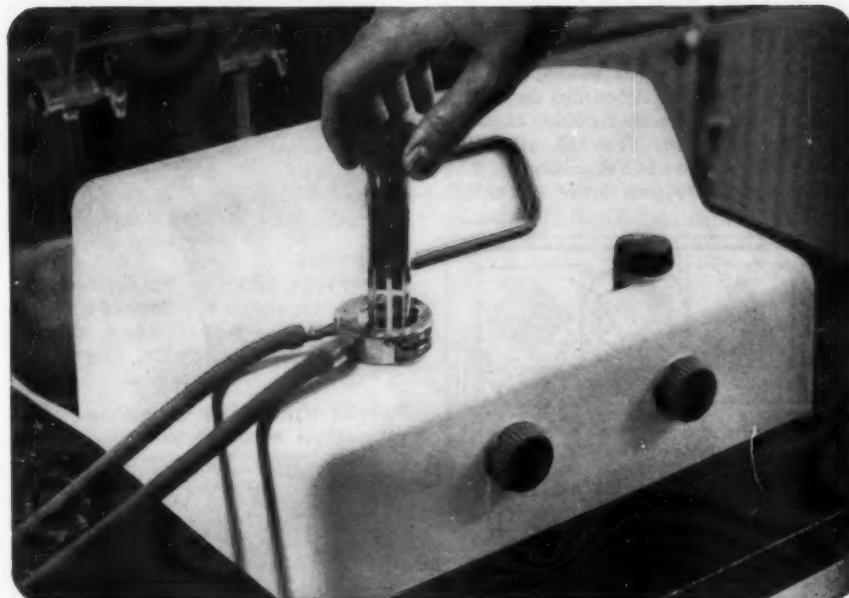
V50 can be used for grinding, buffing, sanding, wire brushing and drilling.

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30 Shear Street Binghamton, New York

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MACHINE AND TOOL BLUE BOOK

Experience—the added alloy in Allegheny Ludlum tool steels



COLORIMETER (inherently extremely accurate) determines percentages of molybdenum, tungsten, cobalt and manganese in A-L tool steel to insure consistent, high quality.

Colorimeter measures exact chemical composition of Allegheny Ludlum tool steel melts

Accurate adjustment of alloys guarantees uniform heat treatment, predictable dimensional changes, reduced grinding, standardized machining operations.

Close control of molybdenum, tungsten, cobalt and manganese is at the heart of a good tool steel melt. In addition to the usual testing methods, Allegheny Ludlum's chemical laboratory checks these metals with Colorimetry because of its inherent, extreme accuracy.

On the basis of the Colorimeter's findings, it is possible to make carefully calculated furnace additions of ferro-alloys, insuring precise control over chemistry. This guarantees your receiving the *exact analysis* order after order, providing *uniformity of heat treatment, predictable dimensional changes, reduced grinding and standardized machining operations.*

Colorimetry is but one step toward careful control over composition. Allegheny Ludlum also sets exacting purchasing specifications on raw materials and scrap. Quality Control checks all incoming orders to see that they conform with these specifications. Another guard toward your getting your exact specifications: each ingot bears a metal tab showing heat number.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier.

**ALLEGHENY LUDLUM STEEL CORPORATION,
Oliver Bldg., Pittsburgh 22, Pa. Address Dept. MB-6**

PHOTO BY T. J. KEELEY

ALLEGHENY LUDLUM

Toll Steel warehouse stocks throughout the country... Check the yellow pages
every grade of tool steel... every help in using it



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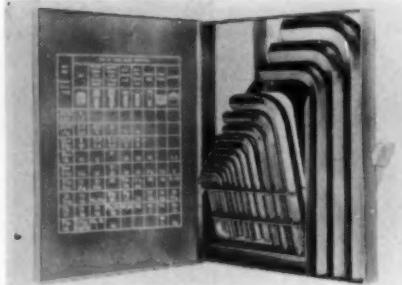
June, 1960

269

Kit Holds Keys To Fit Most Allen Hex-Socket Screws

The No. 667 Allen Key Kit holds hex-socket screw keys in a wide range of sizes to fit all except the largest diameter Allen hex-socket screws.

The kit holds 18 Allen hex keys in a range from the smallest (.028") through $\frac{5}{8}$ " hex diameter. They fit all Allen hex-socket screws in that category. The kit also includes new 7/64" and 9/64" sizes for No. 6 and No. 8 "60" Series



cap screws.

A key fit table on the inside cover of the box shows the correct key size for each Allen socket screw product.

Allen Manufacturing Co., Hartford 1.

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DRILL THESE HOLES

BY A QUICK, EASY INEXPENSIVE METHOD
Your business letterhead will bring literature
WATTS BROS. TOOL WORKS
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Write today for
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1960
Complete
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of Inclinable,
Straight Side,
Gap and Horn
Presses.

GAP

Johnson
POWER PRESSES

JOHNSON MACHINE & PRESS CORP.
620 W. INDIANA AVE., ELKHART, INDIANA

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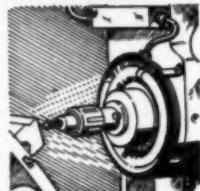
Barrel Finishers Combine Vibration with Rotation



A complete line of Vibraslide barrel finishing machines—including two new,

"Donut"-type
fluorescent fix-
tures direct
light into work
without heat,
shadows, ob-
struction. Wide
application . . .
easy installa-
tion . . . free
literature.

CIRCLELITE



STANDARD BORING MILL LITE CO.
6771 E. McNichols • DETROIT 12, MICH.

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smaller models—is now available through the 3M company's distributors for Honite brand products. The Vibraslide 5 and Vibraslide 10 are in addition to the original machine, still offered in 20 cu. ft. size. It is stated that "Vibraslide" is the only barrel finishing machine combining vibration with rotation.

In the smaller barrels, speed of finish is increased because of greater ampli-

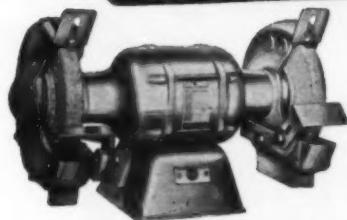
tudes of vibration, the 3M company points out.

With rotation in addition to vibration, it is possible to mass finish parts not previously adaptable to barrel finishing because of shape, material or size. The machines can also be used as regular rotating barrels.

Minnesota Mining and Manufacturing Co., 900 Bush Ave., St. Paul 6, Minn.

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MOST Value-Packed GRINDER MADE!



only \$112⁰⁰

CARBIDE TOOL GRINDER



Model 153-6". Reversible $\frac{1}{2}$ HP motor, 3450 RPM. $1\frac{1}{2}$ " wide wheels. Every part oversize for rugged, long-lasting use. Just \$201.80

BALDOR

MODEL 153-8"

Feature for feature, no other grinder offers so much for so little. Compare HP rating, wheel size, shaft diameter, bearing size with any other similar-type grinder. You'll quickly see why you get more with *Baldor*!

- Big $\frac{1}{2}$ HP motor; won't burnout even if repeatedly overloaded!
- Wide-clearance design provides maximum working room!
- Large 8" first grade wheels!
- Heavier $\frac{3}{4}$ " arbor; larger ball-bearings!
- Dynamically-balanced rotor—extra smooth operation!
- Exhaust-type guards!

Write today for Bulletin 321N on complete line of *Baldor* Grinders and Buffers!

BALDOR ELECTRIC CO.
4353 DUNCAN AVE. ST. LOUIS 10, MO.

Use postpaid card. Circle No. 434

Pre-Packaged Magnetic Particle Inspection Materials

A new development by Magnaflux Corp. is the convenience of magnetic particle inspection materials available in pressurized spray cans and plastic squeeze-bottles. This makes tests easier, when used in field testing and on parts of complex shape being tested on large wet-type Magnaflux units. The No. 14M Fluorescent Magnaglo Bath and No. 9 BM Magnaflux Bath are offered in 12 oz. pressure spray cans. The No. 1 Gray Powder is now available in plastic dispensers, one lb. of material.

Magnaflux Corp., 7300 W. Lawrence Ave., Chi. 31.



Testing premagnetized part for cracks.

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**FOR PEAK TOOL BIT
PERFORMANCE
PICK**



SUPREME

Use this unique steel for the very ultimate in cutting prowess. Highest hardness, highest wear resistance make **Vasco Supreme** the aristocrat of the shop when you want the most! Where production economics call for different bits, use **Neatro**, **Red Cut Superior**, **Red Cut Cobalt**—each a profit-maker in its range. Write for Data Sheets.

**VANADIUM-ALLOYS STEEL COMPANY
LATROBE, PENNSYLVANIA**

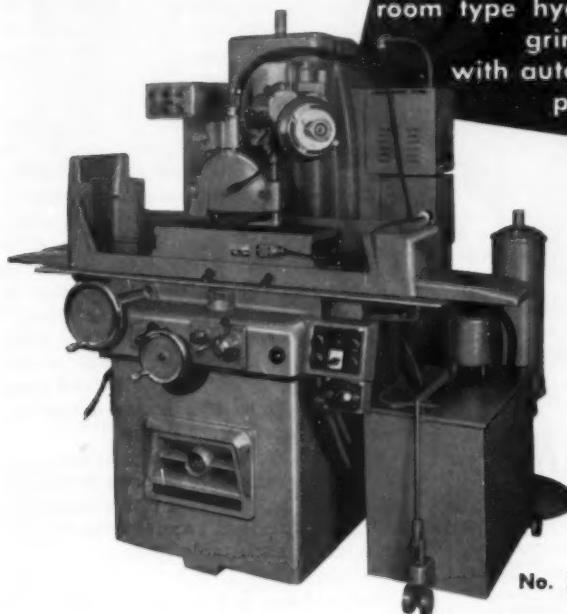
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new

INCREMATIC

downfeed

all Grand Rapids precision tool room type hydraulic feed surface grinders now available with automated cut out after pre-set stock removal



No. 350

Plus other features, too, such as: Rugged, one-piece column and base casting • Greased-for-life precision ball bearing spindle • Instantly variable hydraulic table speed • Variable speed hydraulic cross feed and continuous cross feed • Powered vertical movement of wheel head.

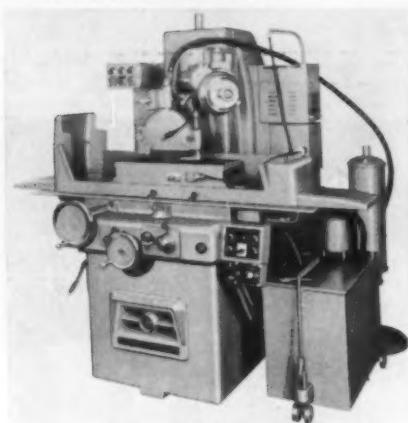
A note on your letterhead will bring full details

**GALLMEYER
& LIVINGSTON**

GALLMEYER & LIVINGSTON CO.
405 Straight Ave., S.W., Grand Rapids, Mich.

Use postpaid card. Circle No. 436

Surface Grinder with Automatic Down Feed



Incrematic down feed, a new automatic down feed device which permits operator to preset amount of stock to be removed and which automatically

shuts off after stock removal, is now available on all Grand Rapids saddle type surface grinders from 6" x 18" to 24" x 48" table size.

Incrematic down feed makes possible complete automatic surface and plunge grinding to extreme repeat accuracy with utmost simplicity. It is also reported to permit the operator to direct dial the amount of stock to be removed in increments of .01" to .0001" and always leaves .0001" for finish pass before going into three pass "spark-out" which automatically shuts off machine.

For automatic surface grinding, the part to be ground is secured to the magnetic chuck or work surface of the machine and grinding wheel is advanced until it makes contact with work. Then total amount of stock to be removed is present. Rate of stock removal is selected and surface plunge selector is set so automatic feed receives "feed" impulses at each reversal of the machine saddle. Automatic cycle is set for surface grinding and auto-feed start button is pressed to place feed mechanism in operation.

Automatic plunge grinding is the same except surface plunge selector is placed in "plunge" position. In this position, the automatic feed receives the "feed" impulses at each table reversal.

Gallmeyer & Livingston Co., 336 Straight Ave., S.W., Grand Rapids 2, Mich.

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Jorgensen
and
Pony

CLAMPS



ADJUSTABLE CLAMP CO.

the clamp folks
403 N. Ashland, Chicago 22, Ill.

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Supplier.
Send for
FREE
32-page
catalog show-
ing complete
line of styles
and sizes.

DURANT HEADED PINS



All tool steel Rockwell C 58/60 — honed finish, no pickup — heads left soft and are guaranteed uniform. Attractively priced at \$12. to \$19. per C. We manufacture 103 and stock 103 sizes for immediate delivery.

Available through our distributor or order direct.
Write for complete prices and details.

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DANNEMAN Precision DIE SETS



Precision
bored on
master
plates

Catalog
on
request

DANNEMAN DIE SET DIVISION

Acme-Danneman Company, Inc.
203 Lafayette St., New York 12 • AL 5-7150

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MACHINE and TOOL BLUE BOOK

new POPE

INTERNAL Precision Grinding SPINDLES

used on BROWN & SHARPE
BRYANT
BULLARD
CINCINNATI
COVEL
EXCELLO

LANDIS
NORTON
REID
THOMPSON
SPRINGFIELD
and others

*with
important
new features
that add up to*

TOLERANCES TO MILLIONTHS

super-precision bearings made to Pope specifications and used exclusively in Pope spindles

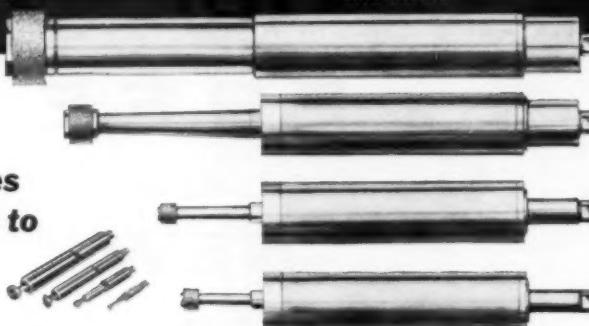
total eccentricity of shaft, measured in the tapered hole, will not exceed 20 millionths (.000020)

Assembled spindles are dynamically balanced with all rotating parts in full assembly to 25 millionths (.000025) amplitude of vibration. This assures low micro-inch surface finishes.

INCREASED PRODUCTION

Pope Spindles have the rigidity and the ability to take heavy cuts and produce uniform parts.

Ask for Catalog No. 57-A and Bulletin No. WA-10, or send us your specifications on the spindles you require.



LOWER OPERATING AND MAINTENANCE COST

Increased wheel life because the extra large shaft is rigidly supported by ample size bearings.

Saved operating time — one motor driving pulley serves all spindles in most cases.

Permanent lubrication — Pope system of grease lubrication prolongs bearing life, minimizes maintenance expense, and the spindles run cool.

New concealed axial air flow coolant repelling finger increases bearing life and reduces maintenance expense.

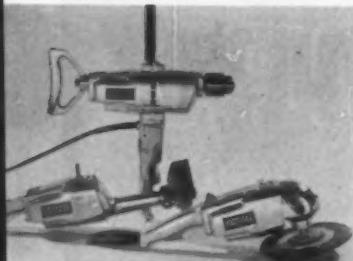
POPE®

POPE MACHINERY CORPORATION • 261 RIVER STREET • HAVERHILL, MASS.

ENGINEERS, DESIGNS AND BUILDS
PRECISION ANTI-FRICTION BEARING SPINDLES
FOR EVERY PURPOSE

Established 1920

Use postpaid card. Circle No. 440



Lighter weight, more powerful.

16 New Portable Power Tools

A completely new line of 16 portable power tools includes 10 heavy-duty drills, in a range of $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1" and $1\frac{1}{4}$ " sizes; three heavy-duty disc sanders in 7" and 9" sizes; a 7" polisher, and two portable grinders in 5" and 6" sizes. Tools are said to be up to 35% lighter in weight, up to 100% more powerful, and have been designed to give more effortless operation through precision balance, better control, greater durability, lighter weight.

Dept. PD, Stanley Electric Tools, Div. of The Stanley Works, 195 Lake St., New Britain, Conn.

Use postpaid card. Circle No. 117

F R E E

to metalworking management!

NEW

16-page illustrated booklet

Vapor-from-paper
STOPS RUST

Now, you can "mothball" your metal parts or products as easily as your wife protects her woolens. This new booklet tells how Ludlow VPI® Wrap cuts costs in shipping and storage. Read how other companies have saved by modernizing their preservation methods. It's FREE! Ludlow Papers, Needham Heights, Mass. Dept. 166.



Use postpaid card. Circle No. 441

Filter Handles 200 to 2,500 GPM Coolant Continuously

Paper filter medium in the new Hoffman Hi-Flo Vacu-Matic filter handling water soluble coolants at flow rates from 200 gpm to 2,500 gpm is shown being indexed automatically. Separation of spent filter paper, sludge, and chips is achieved mechanically. There is no shut-off of dirty coolant through the filter. Filtering is continuous with the sorting of paper from scrap eliminated. Operation is entirely electrical and continuous without use of solenoids, air cylinders or control valves.

U. S. Hoffman Machinery Corp., 103 Fourth Ave., N.Y.C. 3.

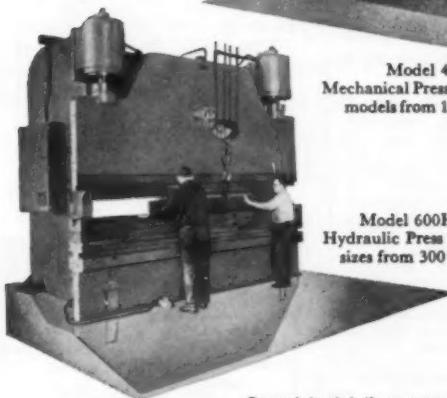


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CHICAGO® PRESS BRAKES

UNEXCELLED ACCURACY

**for sheet metal
and plate work**



Model 410D, 90-Ton CHICAGO Mechanical Press Brake. Other standard models from 11 to 450 ton capacities.

9409
*Complete details or recommendations
on any press brake work upon request*

Press Brakes
Press Brake Dies
Straight-Side-Type Presses
Hand and Power Bending Brakes
Special Forming Machines



**DREIS & KRUMP
MANUFACTURING CO.**
7440 S. Loomis Blvd., Chicago 36, Illinois

Use postpaid card. Circle No. 442



DUPLEX COMBINED BORING AND FACING TOOL HEADS. The new 1960 models include improvements such as a means of attaching the shanks to the body, precluding chance of breakage. Over-all body height has been reduced 1", affording extra rigidity. New dual means provide take-up for wear, which is said to permit the operator to keep the tool in perfect adjustment at all times. Chandler Tool Co., Muncie, Ind.

Use postpaid card. Circle No. 119

Aluminum Step Blocks Used With Plain Or Step Clamps

Northwestern Tools is presenting nine



WIND YOUR OWN SPRINGS

Porter Spring
Winder

Widely used to make springs to 1½-inch I.D., for repair, experimental work and small production runs. Low in cost. Handles wire to 3/16" diameter. WRITE FOR CATALOG.

ADVANCE CAR MOVER COMPANY, INC.
APPLETON, WISCONSIN

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LINLEY JIG BORERS



Give You Maximum Utility—At Low Cost

The improved Linley Jig Borers are more efficient than ever. Accurate and fast in operation—easy to set up. Made for the exacting requirements of small part precision work. Using Linley Jig Borers allows larger capacity borers to be used where intended, on heavier jobs. Once you've installed a Linley, you'll wonder how you got along without it in your shop.

Table Size: 7" x 17½"
Table Travel: 6½" x 10"

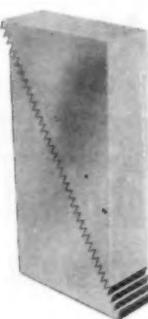
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LINLEY BROTHERS CO.

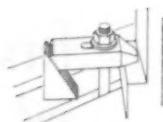
JIG BORERS - RIVET SPINNERS
663 State St. Ext., Bridgeport 1, Conn.

Use postpaid card. Circle No. 444

sizes of aluminum step blocks which can be used with either plain or step clamps. This comprises three sizes of



USED WITH PLAIN CLAMPS



USED WITH STEP CLAMPS

standard blocks 1" wide, three sizes of heavy duty blocks 1½" wide, and three sizes of double duty blocks 2" wide.

The step blocks are interchangeable with each other, with all sizes of steel step blocks, and with all sizes of step clamps.

Northwestern Tools, Inc., 118 Hollier Ave., Dayton 3, Ohio.

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BREMIL

The IMPROVED Compound Lever Shears

ALL ALLOY
FULLY
GUARANTEED



Two Sizes

PORTABLE

No. 1 cuts up to No. 11 gauge strip or sheet.
No. 2 cuts up to ¼" steel plate.

BREMIL MFG. CO.
1020 Holland Street, Erie, Penna.

Use postpaid card. Circle No. 445

MACHINE and TOOL BLUE BOOK



Motch & Merryweather will send a sharp engineer

...A sawing specialist, that is, who can show you how to get the most out of your sawing and sharpening equipment. When you select Motch & Merryweather saw blades you get top quality and top service. Call your M&M distributor.



Cutting Tool
Manufacturing Division
Cleveland 17, Ohio

Use postpaid card. Circle No. 446

June, 1960

279

STOP . . .

HAND WORK

ONE TOOL - UNLIMITED USES



Use these Handy PORTABLE ELECTRIC RECIPROCATING TOOLS for Greater Production, Better, More Uniform Work — All with less Operator Fatigue. Fixed strokes are $\frac{1}{8}$ " or $\frac{3}{16}$ " long. Operate on 110 Volts AC-DC. Deliver 1000 PUSH-PULL strokes per minute. Try one of these tools on your next job.

Send for Descriptive Literature.

ACME TOOL CORP.

73 W. BROADWAY • NEW YORK 7, N.Y.

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ACCURACY is an ECONOMY!
and only precision offers you
HIGHEST QUALITY!

now is the
time
to put your
OLD STEEL
PARALLELS to "LIKE NEW"
conditions and to be ready for the big push.



For the first time Anton Machine Works offers to regrind your old parallels to the following tolerances:

- Parallelism and straightness over length of 6" \pm 0001
- Size tolerance between a pair \pm 00005. A complete list of new parallels in stock will be mailed on request.

ANTON MACHINE WORKS

1226 FLUSHING AVE., BROOKLYN 37, N.Y.

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Precision Boring Quills Allow "Infinite Size Control"

Precision boring quills are said to allow infinite adjustments in controlling the size of holes without loosening or tightening screws. The new quills also permit incorporating depth-control adjustment when required. (top photo). Now the user can "split tenths" (adjust smaller than 1/10,000") to compensate for tool wear by adjusting with a hex-key. Adjustment is accomplished by a small worm-gear drive. This mechanism connected with bar and bar holder provides a positive drive, preventing backlash and slippage when tool is in use (bottom photo).

Quills available fit all standard boring spindles; specials on order.

Prices start at approximately \$275.

Briney Mfg. Co., 1165 Seba Rd., Pontiac, Mich.

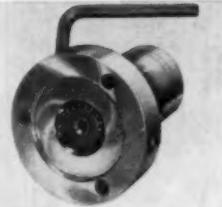
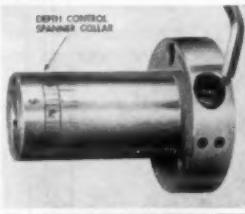
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Compound Angle Sine Table

The Matrix high precision sine table, reported accurate to within 10 seconds of arc, is used for inspection of jigs, and gages and for the manufacture of components in the machine shop on grinding and jig boring machines.

Illustrated is the 9" size; also offered in 13", 18", 26", and 36" diams.

An outstanding feature reported for the table is the substitution for the conventional hinged bearings at 90° of a hemisphere riding in a conical seat



and permitting any angle up to 45° to be set as a single or as a compound angle.

Table can be used also with Auto-Collimator and angle gage blocks for optical settings of angles.

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.

Use postpaid card. Circle No. 122

Heavy-Duty Model For Multi-Head Pneumatic Riveting

A new compact, heavy-duty pneumatic rivet machine is reported as especially suited to multi-head or "cluster" installations. The Model 57 sets semi-tubular, full tubular or bifurcated rivets ranging from $\frac{1}{8}$ " dia. x $\frac{1}{8}$ " long to $\frac{3}{16}$ " dia. x 1" long. A 3" stroke and 12" throat depth is provided. The machine sets rivets on varying centers down to 1". It operates on 60 to 150 psi shop air pressure.

Several Model 57 heads may be grouped on a single base and combined

with slide fixtures or transfer tables as one production unit for automatic cy-



Sets rivets $\frac{1}{8}$ " dia. x $\frac{1}{8}$ " long to $\frac{3}{16}$ " dia. x 1" long.

cling. Maximum cycling speed is governed by rate at which rivets feed into the jaws. Stroke speed is easily adjusted to control impact when fragile materials are assembled.

The Milford Rivet & Machine Co., Milford, Conn.

Use postpaid card. Circle No. 123

**HIGHEST PRECISION
AT LOW COST!**

Vernier Caliper Model 15050 EK5 (illustrated)
from \$14.60 Leather Case Included

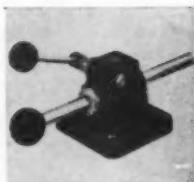
- GUARANTEED ACCURACY TO 0.001"
- EASIER READING WITH DOUBLE VERNIER
- NO EYE STRAIN—DULL CHROME FINISH

Send for complete catalog of over 100 Helios Precision Measuring Instruments.

United States Representative KARL A. NEISE, Inc. NEISE MODERN TOOLS

Dept. MT, 404 4th Ave., New York 16, N.Y.

Use postpaid card. Circle No. 449



DRILL JIG VISSES. The new Adjusto-Quick Jig-Lok eliminates special locking details. It incorporates the same automatic pressure control used exclusively on L-W Adjusto-Quick vises. Simple turning of the control automatically adjusts holding pressure from one up to 1500 lb. Two models are offered with bases 4"x4" or 5"x5". L-W Chuck Co., 23 So. St. Clair St., Toledo 4.

Use postpaid card. Circle No. 140

AIR & ELECTRIC-POWERED NIBBLERS cut ferrous and non-ferrous metals without distortion. One new model cuts corrugated steel by adjusting the cutting head. Cut material falls directly beneath the work, not hurled upwards—a safety factor. Light, medium, heavy, extra-heavy duty models cut materials to $\frac{1}{4}$ " steel, $\frac{5}{16}$ " aluminum. Fenway Machine Co., Inc., 3107 N. Broad St., Phila. 32, Pa.

Use postpaid card. Circle No. 141



THREE NEW OIL BY-PASS RELIEF VALVES, flange type. Models LFC-9 and LFC-10 are $2\frac{1}{2}$ " and 3" sizes. At present, the $2\frac{1}{2}$ " size is available for 60 lb. maximum control pressure; the 3" size, 100 lb. Model HFC-9 is a $2\frac{1}{2}$ " valve for 325 lb. maximum pressure. Both $2\frac{1}{2}$ " valves have 300 lb. standard flanges; 3" valve, 600 lb. The Fulflo Specialties Co., Inc., 436 Fancy St., Blanchester, Ohio.

Use postpaid card. Circle No. 142

ENGINEERED MIST COOLANT EQUIPMENT



Spraymist® BY BIJUR

COMPACT • EFFICIENT • EASY TO INSTALL

Fully automatic operation saves time and trouble. Mist starts and stops with action of machine. No need for manual air valves.

Compact integral unit design includes built-in air filter, trap, regulator, gauge, solenoid valve, conduit box, pressurized reservoir, and coolant filter. No unsightly plumbing, extra valves or controls!

Spraymist available in 18 ounce, 1 gallon and 5 gallon units. 5 gallon units serve up to 20 jets.

SPRAYMIST . . . The modern, compact, engineered way to get all the advantages of mist cooling. Write today for further information.



BIJUR

LUBRICATING CORPORATION
Rochelle Park, New Jersey

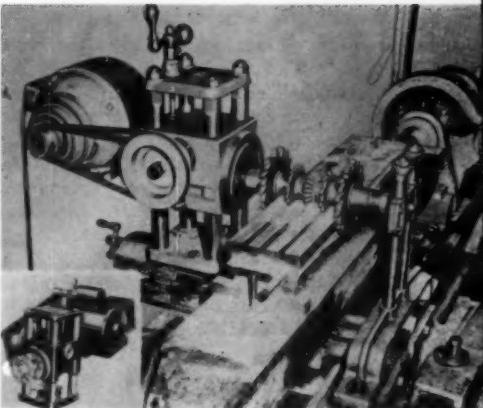


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Two New Unit Sizes Added to Portable Milling Line

Two new unit sizes, Versa-Mil Models 1 and 3, broaden the Dumore milling equipment line to permit milling, drilling, boring, shaping, slotting, grinding, and related machining of small, medium, as well as large-sized work. Dumore claims all units are so compact that they can be easily attached to any standard machine tool.

Model 1, for smaller work, has a metal removal rate of $1/3$ cu. in. per minute, and can be mounted on lathes 10" or larger. Model 2, the original unit, for medium size, general duty, can remove metal at the rate of $\frac{3}{4}$ cu. in. per minute, and mounts on lathes 13" or larger. Model 3, for large work, removes metal at $1\frac{1}{2}$ cu. in. per minute, with 18", or larger, lathe mounting. The outboard arbor support accessory for Model 3, when used with extended arbor, permits heavy straddle milling



Model 1 (inset) is for smaller work. Model 3 is shown with outboard arbor support milling three slots and two sides of a large machine table, all at the same time.

and other machining at a greater distance from the tool face.

The Dumore Co., 1300 Seventeenth St., Racine, Wis.

Use postpaid card. Circle No. 143



DIAL CALIPERS

Model UR68E

Sizes: 6" (illustrated)

8" and 10"

from \$31.50 (without case)

PRECISION
MEASURING
INSTRUMENT



VERSATILE, ACCURATE, TIMESAVING, EASY TO READ

Send for the Complete Catalog of

HELIOS QUALITY INSTRUMENTS

KARL A. NEISE, Inc.

Dept. MT, 404 4th Avenue, New York 16, N.Y.

ONE OF MANY
NEISE
MODERN TOOLS

Use postpaid card. Circle No. 451

Bearings and Ball Screws

Scully-Jones recirculating anti-friction Tychoway bearings and Super-Cision ball screws are companions for supporting machine components moving in a straight line, and for positioning them with a minimum of mechanical force. The manufacturer reports that used together, they help make linear motions completely predictable, accurate and repeatable.

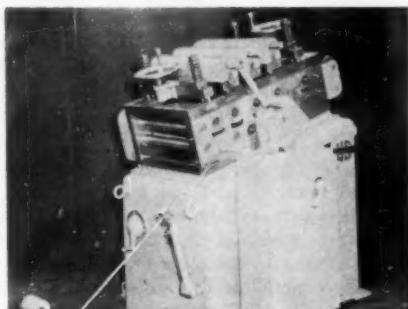
Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, Ill.

Use postpaid card. Circle No. 124

Machine Straightens Stock 16" Wide, 1/4" Thick

Model No. PDS-16H U.S. power driven straightener offers capacity for material up to 16" wide and up to a maximum of $\frac{1}{4}$ " in thickness (cold rolled steel, hot rolled steel, brass, copper, aluminum). This unit is designed for the removal of coil set from mate-

rial in coil form usually used in conjunction with automatic feeding equipment for advancing the material into punch presses, press brakes or other fabricating equipment.



A 5 hp variable speed drive unit offers outputs from 10' to 50' per minute.
U.S. Tool Co., Inc., Ampere (E. Orange), N.J.

Use postpaid card. Circle No. 125

131



the latest
completely
illustrated
free
CATALOG
No. 207

A complete line of vises
and rotary tables for produc-
tion, tooling and maintenance.
68 different models and types.
Vise jaw sizes from $1\frac{1}{2}$ " to 8".

Chicago Tool and Engineering Co.

8384 South Chicago Ave.
Chicago 17, Ill.

Use postpaid card. Circle No. 452

284

KUHLMANN 2- and 3-dimensional PANTOGRAPH ENGRAVERS



For general
engraving—
marking—
profiling—
die and mold
milling

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MACHINE and TOOL BLUE BOOK



Always...

ON THE SPOT!

Here is a fast, accurate gage that has a hundred uses on the production line. It can be used right at the machine, in production, in the inspection department . . . and in the gage laboratory.

Simple to use, it requires no special skill on the part of your personnel. It weighs only 3 lbs.

MICROtrol® 170A transistorized gaging system includes a battery-powered amplifier and four types of interchangeable gage heads for use with production comparators, height gages, snap gages, ID or OD gages and similar bench inspection devices. These replace cumbersome and unreliable mechanical or pneumatic elements.



INDICATOR GAGE HEAD
used with standard height
gage-stand for surface
plate work.



AGD GAGE HEAD used
with snap gage for produc-
tion line inspection.



FRictionLESS GAGE
HEAD used with compara-
tor stand to check produc-
tion parts.

FEATURES

- Only 2 control knobs
- One adjustment zeros both scales
- Large meter with 4.5" scale
- Dual range—from either $\pm .0003"$ to $\pm .003"$ or $\pm .001"$ to $.010"$
- Accurate—transistorized throughout
- Pocket-sized— $5\frac{1}{4}$ " square by $3\frac{1}{8}$ "
- Mounting adapters and gage head stored in cover
- Carrying case handle doubles as amplifier stand
- Lightweight—weighs only 3 lbs.
- Battery powered—can be used anywhere
- AA dry cells can be used in emergency
- AC line operated unit available.

BASIC GAGES START AT \$341.00

Contact your nearest Cutler-Hammer office or order direct from



**AIRBORNE INSTRUMENTS
LABORATORY**

DEER PARK, LONG ISLAND, NEW YORK

A DIVISION OF CUTLER-HAMMER, INC.

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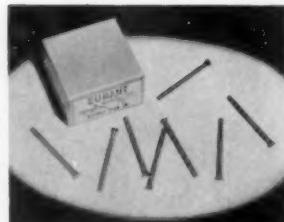
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New Sizes in Durant Headed Pins

Durant Tool Co. announces it is introducing heretofore unobtainable sizes in headed pins. These sizes include pins up to $\frac{1}{4}$ " in dia. in 2", 4", and 6" lengths. All tool steel Rockwell C 58/60 honed finish with heads left soft, these new headed pins are said to have no pickup and are guaranteed uniform. These are added to the firm's 111 different sizes.

Durant Tool Co., 12 Thurbers Ave., Providence 5.

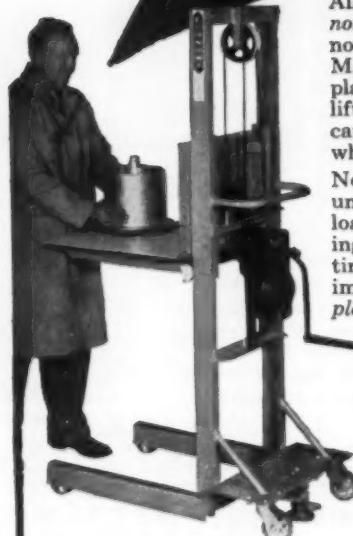
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Up to $\frac{1}{4}$ " dia.; 2", 4", 6" long.

ALL NEW MARK II Shoplifter

New Low Price \$195.00*
New Capacity Full 750 lbs.



ECONOMY
ENGINEERING

4505 W. Lake St., Chicago 24, Ill.

All lifters at this price are not the same. Compare and note the quality of the new Mark II, which now replaces the Type D Shoplifter. Full 750 lb. capacity can be handled safely anywhere on the platform.

No-drift, full control hoist unit. Raise or lower the load to fractional positioning. Built for years of continuous service with minimum maintenance. Complete safety features included at no extra cost.

Applicable in small plants for "too heavy to lift loads" and in large plants to supplement powered equipment. The economical way to transfer molds and dies, unload trucks, stack in narrow aisles, or raise parts and machinery to working levels.

Write for specifications and other details.

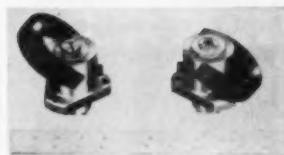
*Priced f.o.b. Chicago

Use postpaid card. Circle No. 454

Collet Holding Fixtures

A new line of collet holding turn-table fixtures for small-area index set-ups has been announced. These fixtures take 3 C collets. Their small size allows close grouping of several fixtures on small index tables. Height is 2 $\frac{1}{2}$ " and the flange area covered is approximately 3 $\frac{1}{8}$ " dia. Standard, small press, chucking, milling, tapping, and other machines can be tooled easily with these fixtures.

Zagar Inc., 23900 Lakeland Blvd., Cleveland 23.



For small-area index set-ups.

Use postpaid card. Circle No. 127

A complete line of Unisorb Pads and Unisorb Level-Rite Mounts for fast and simplified installation of all types of machinery and equipment.

- Cuts installation costs up to 70% . . . eliminates bolts and lag screws . . . speeds installation . . . no drilling required . . . machines can always be moved quickly.
- Eliminates up to 85% of transmitted vibration and noise . . . increases machine life and efficiency . . . reduces maintenance.
- Unisorb Level-Rite provides fast and precise leveling.
- Safe, sure grip . . . can be cemented if needed.
- Unisorb is available in wide variety of densities and thicknesses — for maximum efficiency. Send for bulletin, today.

FEB-64

UNISORB

203 SOUTH STREET
BOSTON, MASS.

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June, 1960

287

Cutters For Wire Rope And Prestressed Cable

The compound-lever, bench cutters are made in two sizes. The No. B size will cut $\frac{5}{8}$ " and lighter wire rope and $\frac{3}{8}$ " and lighter prestressed cable. No. C size is used for cutting $1\frac{1}{4}$ " and lighter wire rope and prestressed cable larger than $\frac{5}{8}$ ". Blades are made of HCHC steel for long wear.

Cut Cutting Costs

KELLER POWER HACK SAWS

5 SIZES . . . 10 MODELS

MODEL

3CH

WET

CUT

$6\frac{1}{4}$ "

X

$6\frac{1}{4}$ "

\$455.00
F.O.B.
Eau Claire, Wis.

CONTROLLED FEED PRESSURE. 40 to 170 lbs., two speeds and automatic lift on return stroke gives you faster cutting, longer blade life. Rugged, Ollite bearings throughout, 45° swivel vise and other features. Ask your Industrial Distributor about KELLER Power Hawksaws or write for Bulletin 360 with prices.

KELLER DIV.

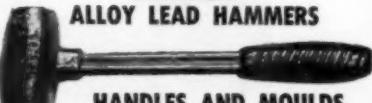
Sales Service Mfg. Co.

2361 University Ave. St. Paul 14B, Minnesota
Use postpaid card. Circle No. 456



T. H. Lewthwaite Machine Co., 312
E. 47th St., New York 17, N.Y.
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**BALANCED
ALLOY LEAD HAMMERS**



HANDLES AND MOULDS

1, 1½, 2½ and 5 lb. sizes—order your
alloy lead hammer requirements from your
mill supply house.

or direct from:

KITZMAN MFG. CO.

Manufacturers Of Lead Hammer Products

15061 Hartwell Ave. Detroit 27, Mich.
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SPELLMACO "SPOTTERS"

A matched set of transfer punches

for toolmakers, machinists & tool cribs

Used for transferring location of threaded, drilled
and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel—Carefully heat treated and tempered for
long life—0025 undersize to facilitate use—Black oxide finish

Set No. 3-17, 28 punches with indexed stand—sizes $3/32$ " to $1/2$ ", by $1/64$ "—
plus handy $17/32$ " size. Length 4-7/8" ONLY \$19.40

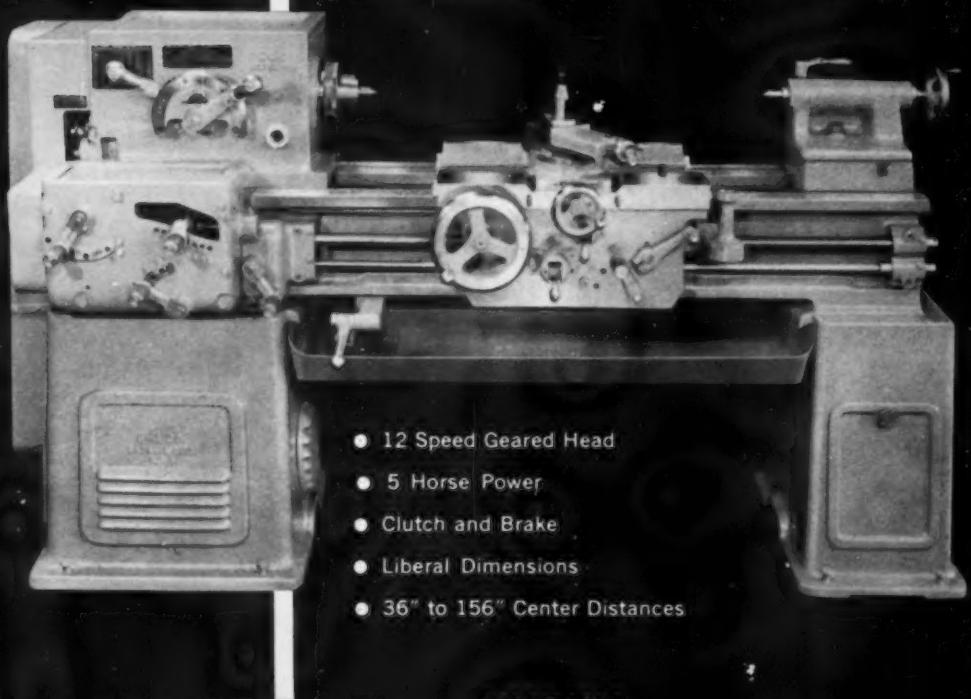
Single sizes available

R. L. SPELLMAN CO. - URBANA, OHIO

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16" AND 18" MASTER MODEL GH LATHES



- 12 Speed Geared Head
- 5 Horse Power
- Clutch and Brake
- Liberal Dimensions
- 36" to 156" Center Distances

HUSKY

BUILT-IN PRECISION

LONG LIFE

LOW INITIAL COST

16" x 6' - \$3240



CARROLL-JAMIESON
MACHINE TOOL CO.

IN OUR 58th YEAR

BATAVIA, OHIO

Accurate Clearance from O.D. to WEB...



makes drills
sharpened on
STERLING
DRILL
GRINDERS
CUT
FASTER,
LONGER

Model "DV"

Grinds ALL drills $\frac{1}{8}$ " to $2\frac{1}{2}$ ",
90° to 140° included angle,
2-3 or 4 lips.

SIMPLE, positive adjustments with built-in direct reading gauges allow accurate setting of clearance angle and included angle. Grinding action generates a true conical clearance angle that is constant from O.D. to web. Drill enters work easier, cuts freer, produces more holes per grind. Set-ups are fast because no chucks or collets are used. Locating on lip being ground produces accurate centering.

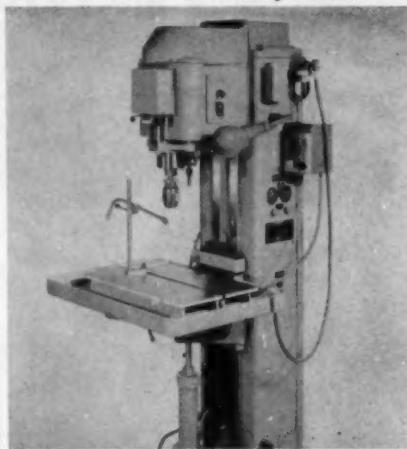
For a LOW COST Drill grinder with BIG CAPACITY ask your distributor about the STERLING Model "DV" or write for complete information.

McDONOUGH
MANUFACTURING CO.
1520 Galloway • Eau Claire, Wis.

Use postpaid card. Circle No. 460

290

Drilling Machine Drills 3/16" — 5/8" in Alloy Steel



Two ranges of spindle speeds (with eight speed changes in each range) cover from 300 to 1800 rpm.

A new vertical universal drilling machine, with infinite hydraulic feed control in conjunction with air feed, has been announced. The hydraulic unit is adjustable for the amount of feed required and assures steady feed on interrupted cuts or break-through.

This new No. 3 machine has a drilling capacity of 3/16" to 5/8" in alloy steel. Work table is automatically positioned by air for quick change of tools and fixtures. Two ranges of spindle speeds (with eight speed changes in each range) cover from 300 to 1800 rpm. Solenoid units built into the machine synchronize clamping and indexing fixtures with spindle cycle.

Snow Manufacturing Co., 435 Eastern Ave., Bellwood, Ill.

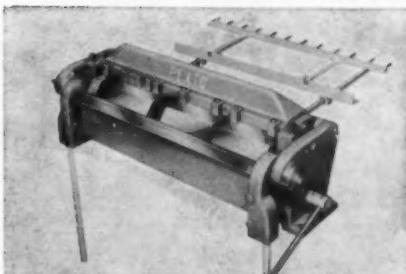
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Box and Pan Brake Bends Sheet Metal Up to 16 Ga.

The new PX-24 box and pan brake bends sheet metal up to 16 ga. and offers many refinements in gauging and adjustments.

The Pexto flip-over gauge gives 0°

MACHINE and TOOL BLUE BOOK



to 24" positioning without reversing or

removing the gauge bar. A stop collar is adjustable to any angle 0° to 135°. Fingers are arranged to form $\frac{3}{4}$ " to 24" in $\frac{1}{4}$ " increments, with a full 3" forming depth with $\frac{1}{2}$ " recess of underside of fingers.

New speed of performance is made possible by the design of upper bar and bar clamp.

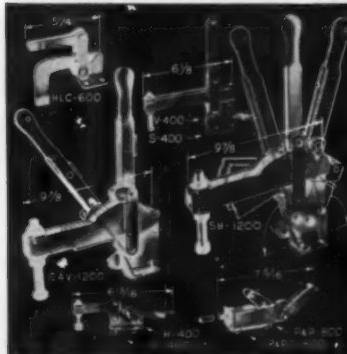
The Peck, Stow & Wilcox Co., Southington, Connecticut.

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**THERE ARE
KNU-VISE
PRODUCTS
TO MEET YOUR EVERY
CLAMPING NEED
(OVER 150 MODELS)**

LAPEER devices are the choice of leading manufacturers for all operations requiring fast and reliable clamping.

Recognized as clamping engineers we can give you much valuable assistance. We will gladly discuss your clamping problem at your plant.



LAPEER MANUFACTURING CO.

3052 DAVISON ROAD, LAPEER, MICH.

Manufacturers of over 150 models of manually and air-operated clamps and pliers.

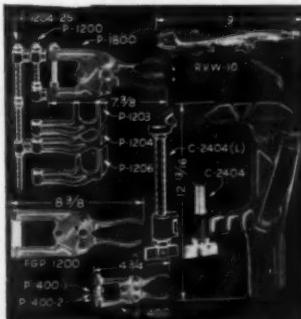
WESTERN DIV.: PECK and LEWIS CORP.

4436 Long Beach Ave., Los Angeles 58, Calif.

CANADIAN DIV.: HIGGINSON EQUIP.

SALES, 1131 Pettit Road, Burlington, Ontario

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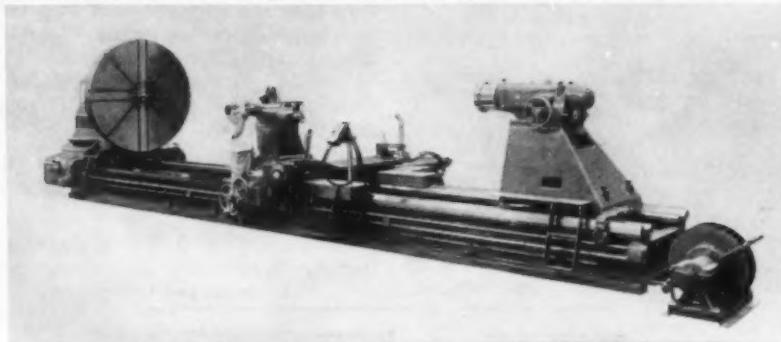


**UNMATCHED FOR RUGGED USE,
DEPENDABILITY,
SPEED AND LONG SERVICE**

They were developed through exhaustive tests in laboratory and years of practical use.



Lathe Handles Work Up to 40 Tons, Cuts To $\frac{3}{4}$ " Depth



Four sizes offered, with 74" to 108" swings over the bed.

The Maxi-Swing engine and tracer lathe has been designed to handle heavy work, up to forty tons and will make precision cuts to $\frac{3}{4}$ " depth. It is available in four sizes with swings from 74" to 108" over the bed. The bed is 56" wide with four hardened and

ground replaceable Vee-ways. The tracer lathe is completely equipped with carriage mounted power unit and motor, all hoses and fittings, hydraulic tracer valve, angle tracer slide with hydraulic actuating cylinder, periscope-type precision optical viewer, template

Dimensional check on 7 planes in one set-up!

Up to 50% savings in time and manpower

Every angle, diameter, line, critical surface on 7 V-block planes is completely checked without disturbing the initial set-up. Previously a two-man operation . . . now, with motor-powered, push-button tilting and rotation offered by the ROTAB precision positioning table, one man quickly, accurately runs the entire inspection in about half the time. This is how ROTAB is paying off for a major diesel engine manufacturer . . . ROTAB will pay off for you, too. Write for details.



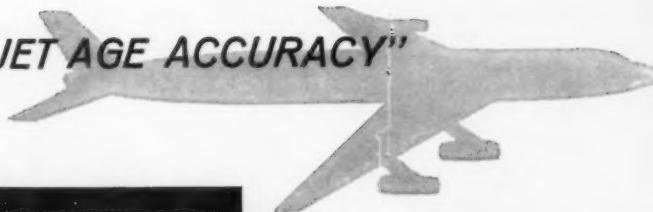
Faceplates from 12"
to 84" in diameter

MACHINE PRODUCTS Corporation

6771 E. McNICHOLS ROAD • DETROIT 12, MICHIGAN

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for "JET AGE ACCURACY"



FOREDOM
miniature
**FLEXIBLE SHAFT
MACHINES**
*supply the control and
precision needed for
sensitive instrumentation*

**Grinding & Finishing • Engraving & Marking • Tool Maintenance
Filling • Buffing & Polishing • Sanding & Brushing
Mold & Die Work • Deburring**

The Sensitive Altimeters made by Kollsman Instrument Corporation must give altitude readings of complete accuracy throughout a wide range of pressures and temperatures, and Foredom Flexible Shaft Machines help assure this precision. In the photograph shown here, a Kollsman craftsman uses a bench model Foredom machine for one of the many delicate finishing operations required on an altimeter mechanism body.

Foredom's slim handpieces respond to the slightest pressure and give perfect control at all speeds. And there's nothing better for getting into small openings and other inaccessible spots. If you work on metal, plastic, leather, rubber, wood or glass, there's a Foredom machine and handpiece ideally suited to your operation.

For more information, write for catalog 210-M6

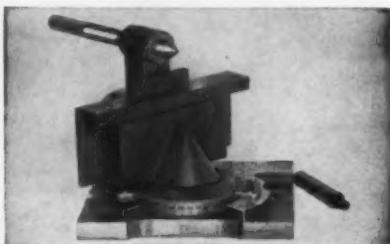
FOREDOM ELECTRIC COMPANY, INC.
Manufacturers of miniature power tools
BETHEL, CONNECTICUT

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June, 1960



**THE CRYSTAL LAKE
DIAMOND-CONE WHEEL DRESSER
FOR SUPERFINE FINISH:**



1. One to Four Microinch Surface Finish.
2. Hydrodynamically Controlled Motion.
3. Coolant flushed wheel surface during dressing.
4. Double Cone Construction.
5. Direct Radius Control to .0001".
6. Oil Sealed bearings.
7. Universal use — Cylindrical, internal & surface.

Write for Literature

CRYSTAL LAKE ENGINEERING CO.

Engineers and Designers Since 1920
10 Gates St., P.O. Box 98, Crystal Lake, Ill.
Dealer Inquiries Invited.

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**Revolutionary New
Chuck and Actuator!**



Safe, proven Gamet Air Chuck and Power-grip Chuck Actuator installs easily on your lathe. Saves money—gets results. Makes it possible for you to:—

- Use lathe for both bar and chucking work.
 - Use the draw tube hole for coolant, or tools.
 - Eliminate air leaks and reduce fly-wheel effect.
- Guaranteed for One Year. Chuck Size 4 1/4" to 14".

POWER GRIP, INC.
ROCKFALL, CONN.

Use postpaid card. Circle No. 465

holder brackets and adjustable supports for flat templates.

Internal geared face plate drive, pendant controlled operation including apron feed clutches, 7 1/2" diameter tail stock spindle, and traveling operator platform, are standard equipment for either engine or tracer lathe.

This machine is designed for accuracy and convenience of use in steel mill maintenance, shipbuilding and repair, missile and similar types of work in the heavy industries.

The American Tool Works Co., Pearl St., at Eggleston Ave., Cincinnati 2.

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**Conveyor-Type Washer Cleans
Small Stamped & Forged Parts**

This Ransohoff vertical conveyor-type washing machine, designed for the inter-process cleaning of small stamped and forged parts, washes a 300 to 1500 lb. work load each hour. With its 11' vertical conveyor only 16 sq. ft. of floor space is required.

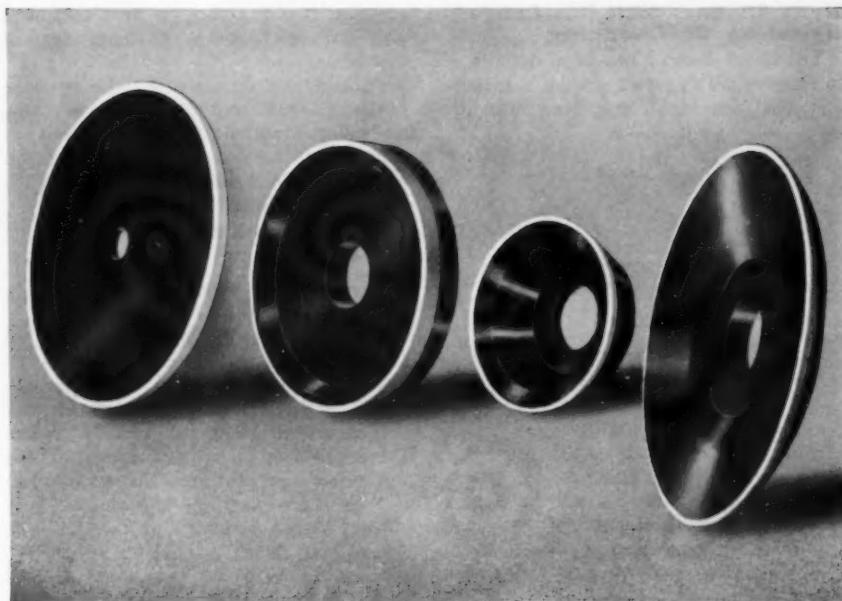


A separate conveyor carries the work to the charging hopper. Parts are given a thorough spray cleaning as they are conveyed upward to the end of the conveyor where parts are automatically discharged. Parts are discharged at or near ceiling level or the conveyor may be extended to discharge the work on the floor above.

Unit is complete with conveyor assembly, pump, motors, and switches.

Ransohoff Co., North 5th St. at Ford Blvd., Hamilton, Ohio.

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MANHATTAN DIAMOND WHEELS

Cut Cool and Free—Last Longer

Manhattan Diamond Wheels are engineered to give you faster, cooler cutting and longer life.

Advancements in Diamond Wheel construction and NEW RESINOID BOND developments fully utilize the advantages of both man-made and natural diamond insuring top performance from all Manhattan Diamond Wheels.

TRY Manhattan Diamond Wheels on your toughest application—find out for yourself how they perform in your plant—under your conditions—on your operation.

- New Bonds
 - Longer Life
 - Bonded for Specific Grinding Requirements
 - Natural or Man-made Diamonds
- "MORE USE PER DOLLAR"**

RM1061R

ENGINEERED
RUBBER
PRODUCTS
...
"MORE USE
PER DOLLAR"



**WRITE TO DIAMOND WHEEL DEPARTMENT
MANHATTAN RUBBER DIVISION—PASSAIC, N.J.
RAYBESTOS-MANHATTAN, INC.**

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June, 1960

295

Hand Cleaner Will Not Cause Irritation Or Chapping

The hand cleaner has been developed to remove all types of grease, oil, loose dirt, cast iron dust, graphite, ditto ink,



industrial ink, and paint. Also, it will eliminate odors which commonly come in contact with the hands.

This hand cleaner is of the water type and is guaranteed not to cause any irritation or chapping of the skin. The manufacturer also states the

cleaner does not contain any abrasives and will not present drainage system problems.

Packed in 8-oz. polyethylene squeeze bottles, 1-gal. and 5-gal. metal cans, and 30-gal. and 54-gal. steel drums. A sample will be furnished by request on company letterhead.

Metallocid Corp., Huntington, Ind.

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Spark Proof Fan For Aget Dust Collectors

A new spark proof, cast aluminum fan has been announced for use in Aget's dust collectors. The fan is offered, without additional cost, on the standard Model 800, 1100, and 500 series Dustkops. Advantages reported are lighter weight because of aluminum, and improved suction efficiency.

Aget Manufacturing Co., 1384 Church St., Adrian, Mich.

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NEW!

Patented CONCENTRICITY GAGE

- QUICKLY INTERCHANGEABLE SPINDLE FOR LASTING ECONOMY
- LARGE, LIGHT-WEIGHT HANDLE ROTATES WITH SPINDLE IN BALL BEARINGS (INDICATOR REMAINS STATIONARY)

Write for 32-page catalog

ZERO

ZERO INTERNAL GAGE CO.
11360 Schaefer Hwy • Detroit 27, Mich.

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BORING BAR
by
MODERN

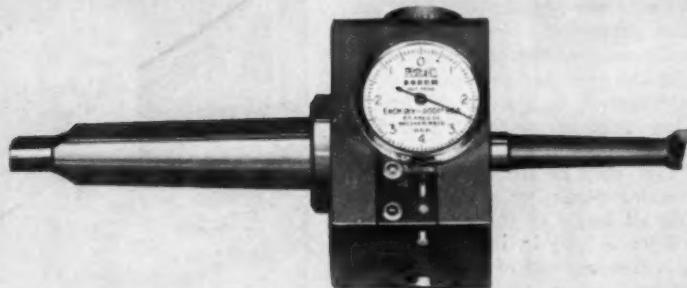
KILLS VIBRATION, CHATTER!

Scientifically designed to diminish vibration in boring, the MODERN boring bar has various size holes drilled from each end to minimize harmonic vibration. Hole diameters were determined by using a VIBRATION METER and probing bar every $\frac{1}{4}$ ". The cavity is filled with shock absorbing material under vacuum, thus obtaining a dead bar of superior strength.

MODERN
MANUFACTURING CO., Inc.
680 Davisville Road, Willow Grove, Pa.

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NOW



**Tolerance
of .000050"**

Put your Bokum tool in the Bokumicro-Dial Boring Head*. For set-up, bore a hole a few thousandths undersize. Measure the hole and move the dial indicator (which moves the tool) to the exact reading you wish —you can read directly 50 millionths of an inch! You get absolute accuracy on production runs or tool room work. It's Bokumagic! Write today!

BOKUM TOOL COMPANY, INC.



TRADE MARK REG. U.S. PAT. OFF.

14775 WILDEMERE AVENUE

DETROIT 38, MICHIGAN

*PATENT PENDING

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Slotter Features Pushbutton Control, Ease of Set-Up

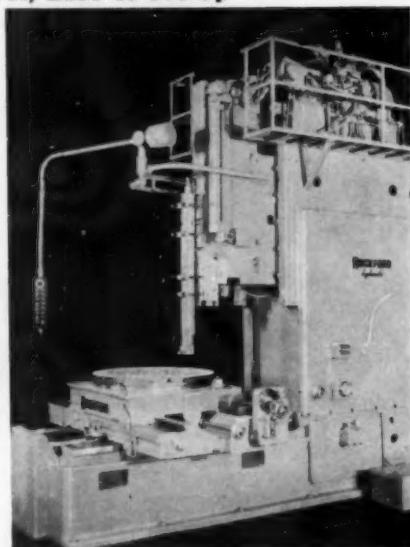
The important feature of the new SM "36" stroke Hy-Draulic Slotter is the counterbalanced pendant, operating through 240° range. This permits operator to run machine from any position. No levers are required for the engagement of any feed or traverse movement. The pendant provides selection for longitudinal, rotary and transverse movements. Two-speed traverse is available, enabling the operator to reposition the stroke, lengthen or shorten it directly from the pendant, without levers or cranks, or stopping the machine.

The ram may be tilted for travel in any angular plane, providing applications on all kinds of slotter work.

The drive is fully hydraulic, with two speeds and servo control to 40 hp pump.

The model is equipped with built-in dividing head for power indexing of keyways, serrations, gear teeth and other machining cuts.

Rockford Mach. Tool Co., Rockford, Ill.



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haskins

The Handiest Tool in Your Shop

Depend on equipment that does the job best with the lowest cost.

Use *haskins* equipment for longer life, more trouble free service, and real economy.

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**R. G. HASKINS CO.
2645 W. Harrison St., Chicago 12, Illinois**

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Want low-cost parts finishing?

NOW—CHOOSE FROM

7 NEW ALMCO VIBRASHEEN MACHINES

TO DO YOUR

- DEBURRING
- DESCALING
- BURNISHING
- SURFACE REFINEMENT
- CLEANING

10 to 100 Times
FASTER!

7 SIZES FOR EVERY JOB REQUIREMENT

Model	Tub Capacity	Tub Size, Inside		
		Length	Width	Height
VT-70	¾ gallon	2"	4½"	6"
VT-71	1 cu. ft.	12"	12"	12"
VT-72	2½ cu. ft.	15"	16"	18½"
VT-75	5 cu. ft.	31"	17"	19½"
VT-77	7 cu. ft.	31"	17"	22½"
VT-712	12 cu. ft.	35"	25"	30½"
VT-717	17 cu. ft.	47"	25"	30½"



IT'S A FACT! With the seven (7) new ALMCO Vibratory Machines, you can expect finishing time cycles 10 to 100 times faster than with standard horizontal barrel finishing equipment. It's a significant production break-through, made possible by creating constant vibratory motion to activate the entire mass of media and parts in the finishing container, as compared to only 20% activation with conventional barrel finishing methods. The uniform vibratory motion of the media in recessed areas, blind holes and small I.D. dimensions make it possible to obtain optimum results on a multitude of applicable parts with intricate configura-

tions that can not be completely processed in standard horizontal barrel machines.

What's more, this amazing metal finishing machine only requires 50% of the floor space that is taken up by any other machine of this type with a similar capacity. Time and motion is at the absolute minimum with all convenient operating conditions.

Tub features. Holds a 2½ cu. ft. load of parts and media. Equipped with vibrating mechanism adjustable for impact range of from 600 to 2550 lba.; has a vibration frequency of 3380 rpm with variable drive optional. Pivots through 180° arc. Lined with tough $\frac{3}{8}$ " plastisol. Quick-acting cam-lock drain door facilitates flushing of tub.

Investigate today, the ALMCO Vibra-Sheen way!

ALMCO

Queen Products Division • King-Seeley Corporation

46 E. Main St. • Albert Lea, Minnesota

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IN ENGLAND: Almco Division of Great Britain, Ltd., Bury Mead Works, Hitchin, Herts, England

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June, 1960

299



FREE

NEWS ABOUT
ALMCO'S NEW PRODUCTS

New Almco Album describes the latest in metal finishing machines, methods and media. Write today for free copy!

Why Wait

FOR SPECIAL TAPS, DIES AND GAGES?

RUTLAND TOOL & SUPPLY CO.

Has them IN STOCK for
IMMEDIATE DELIVERY!



HIGH SPEED

SIZE	THREAD
4	32-48-60-64
5	30-32-35-48-80
6	35-49-48-56-60
7	32-40
8	24-30-36-38- 40-44-48
9	24-28-32-40
10	28-30-36-40- 46-64
12	20-28-32-36
14	20-24-28
1/16	60-64
5/64	72
3/32	48
7/64	48-56
1/8	32-40
5/32	32-36-40
9/64	36-40
11/64	36
3/16	20-24-32
13/64	32
7/32	24-28-32
1/4	18-24-26-27- 30-32-36-40
5/16	16-20-22-27- 28-32-40

RIGHT HAND TAPS

SIZE	THREAD
1-3/4	8-10-12-14- 16-18-20-24
1-13/16	8-10-12-14- 16-18-20
1-7/8	8-10-12-14- 16-18-20-24
1-15/16	8-10-12-14- 16-18-20-24- 28
2	4-1/2-8-10- 12-16-18-20
2-1/16	12-14
2-1/8	12-16-20
2-3/16	12-16
2-1/4	4-1/2-8-12- 14-17-18
2-5/16	12-18
2-3/8	12-16-18
2-1/2	8-10-12
2-9/16	18
2-5/8	12-16-20
2-3/4	16
2-7/8	8-12-16
3	8-16
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SIZE	THREAD
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1/2	12-14-16-18-22-24-26-27-28-30-32-40
9/16	16-20-24-27-28-30-32-40-48
5/8	12-14-16-20-24-27-28-32-40
11/16	11-16-18-20-24-27-28-30-32
3/4	9-11-12-14-18-20-24-26-27-28
13/16	10-14-18-20-32
7/8	10-12-16-18-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-32
1	10-12-16-18-20-24-27-32-40
1-1/16	12-14-16-18-20-24
1-1/8	8-10-14-16-18-20-24-32
1-3/16	8-10-12-14-16-18-20-24
1-1/4	8-10-14-16-18-20-24-32
1-5/16	12-14-16-18-20-24-32
1-3/8	8-10-14-16-18-20-24
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300

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Detroit Stamping Co., 330 Midland Ave., Detroit 3, Mich.

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Quick Sliding Motor Bases

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Height is 1-9/16" or 1-21/32" and amount of movement is 4 1/2" or 6", depending on NEMA motor frame number.

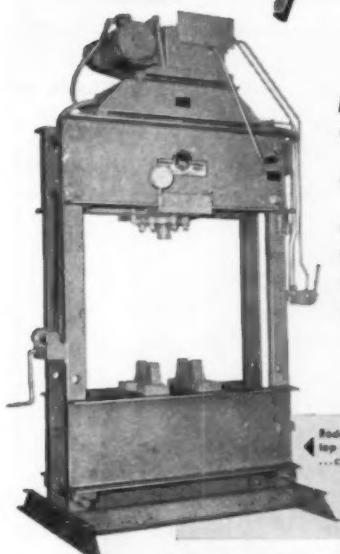
Bases may be used with any V-belt drives, but are particularly designed for use with variable-speed drives.

T. B. Wood's Sons Co., Chambersburg, Pa.

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MACHINE and TOOL BLUE BOOK

A Rodgers Shop Press is BEST for YOU!

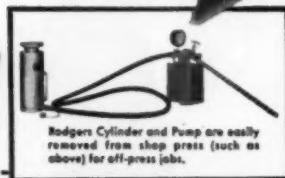
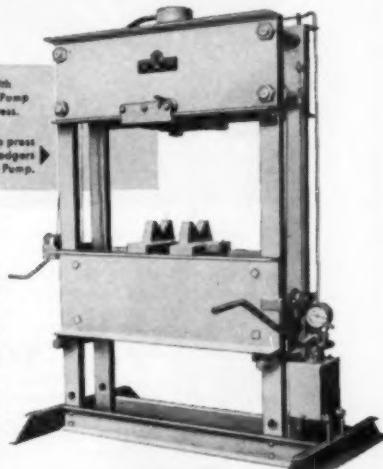


HERE'S WHY:

- **LONGEST RAM TRAVEL** with maximum hydraulic power throughout entire stroke.
- **REMOVABLE CYLINDER** for independent hydraulic power away from the press.
- **CYLINDER TRAVEL** full width of press, either way.
- **OPEN ENDS** allow long pieces to extend through sides of press.
- **EXTRA WIDE** inside work space to handle bigger jobs more easily.
- **GREATER STRENGTH** with heavy bar stock sides and pins—bearing blocks support bolster to give uniform distribution of pressure.

Rodgers 100 ton shop press with top mounted Greencore Power Pump...cylinder travels width of press.

Rodgers 100 ton shop press with Rodgers 2 speed Hand Pump.



WHEN YOU INVEST in a shop press it is more important to compare performance than initial cost!

Rodgers Shop Presses are designed and built for the most versatile service, and longest trouble-free life. In the shop they handle hundreds of diversified jobs...pressing, bending, straightening, assembling. For field work the Rodgers cylinder and pump are easily removed from the press, making an ideal portable power unit for jacking, lifting, heavy shaft removal and similar work.

Rodgers produces the most complete line of shop presses available—capacities from 60 to 400 tons—in varied standard models with power pumps, top mounted or placed at the side—or hand pumps with 2 or 3 speeds.

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SEND FOR NEW CATALOG . . .

It gives useful information
and complete specifications.



Rodgers Cylinder and Pump are easily removed from shop press (such as above) for off-press jobs.



RODGERS HYDRAULIC, Inc.

Pioneers in High Pressure Hydraulics Since 1932

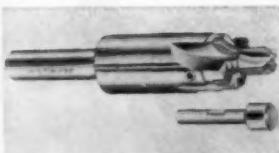
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Carbide-Tipped Port Contour Cutters

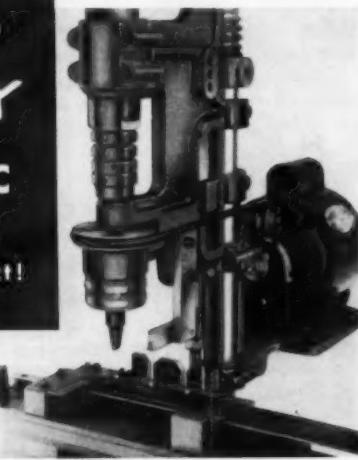
A complete line of improved carbide-tipped port contour cutters is offered for AND 10050 standard hydraulic fittings. They are available in sizes from $\frac{1}{8}$ " to 2" tubing OD. Cutters have precision ground bodies for bushing guidance and are equipped with a removable tap hole reamer that may be interchanged with an optional end pilot. This offers two tools in one and may be set up for the needs of the job. Tool is of the four-flute type.

Wetmore Tool & Engineering Co., 5320 E. Washington Blvd., Los Angeles 22, Calif.



Sizes from $\frac{1}{8}$ " to 2" tubing OD.

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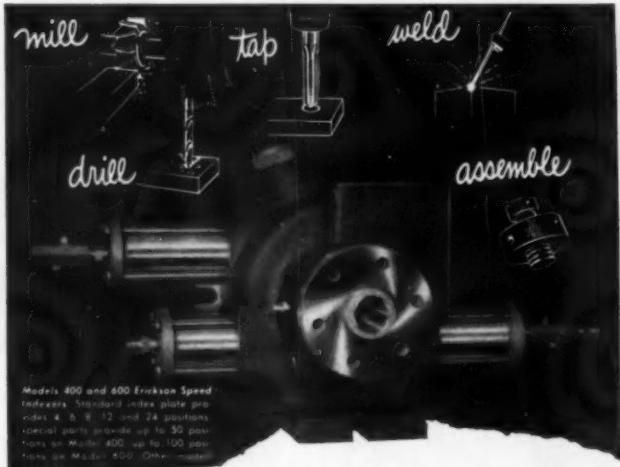
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LEMERT ENGINEERING CO., INC.

Factory: 203 E. Jefferson St., Plymouth, Indiana, U.S.A.

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MACHINE and TOOL BLUE BOOK



Models 400 and 600 Erickson Speed Indexers. Standard index plate provides 12, 18, 24, or 36 positions. Special parts provide up to 50 positions on Model 400, up to 100 positions on Model 600. Other models available.

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Grinding & Polishing Machinery Corp., 2530 Winthrop Ave., Indianapolis 5, Ind.



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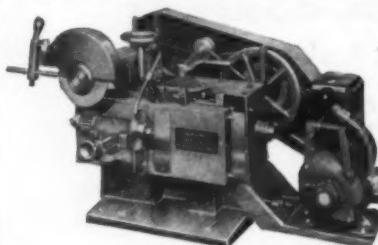
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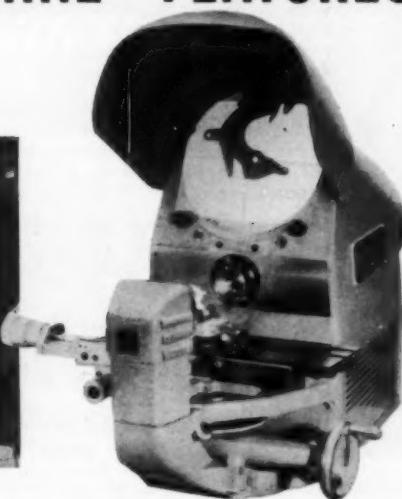
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**COMPARATOR
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- **A Study In Grinding Techniques,** the story of how one manufacturer successfully ground aluminum oxide missile nose cones. Although special techniques, machines, and fixtures were developed for this job, much of his experience can be applied to your grinding department. **Page 131**
- **Why Do Cutting Tools Fail?** is asked by Dennis Jones in his column on CUTTING TOOLS. New theories on this question are being offered from many sources. Here's a review of the problem and what it means to you. **Page 111**
- **Why Slow Down For The Cut-Off?**—Horace Frommelt points out that it may not be necessary to slow spindle speeds down for the parting tool. By using carbide tipped cut-off blades, high speeds may be maintained. **Page 138**
- **Which Is The Best Method To Make A Part?**—Columnist Allan Young discusses several ways to make a particular part and then charts the cost for each method for varying quantities. The cheapest method will surprise you. **Page 119**

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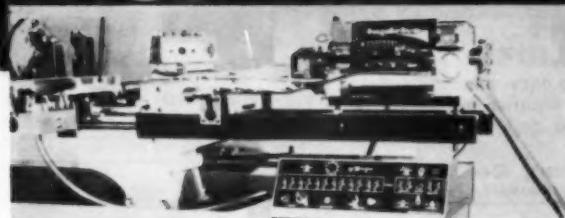
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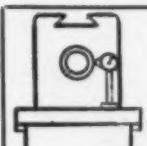
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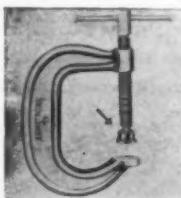
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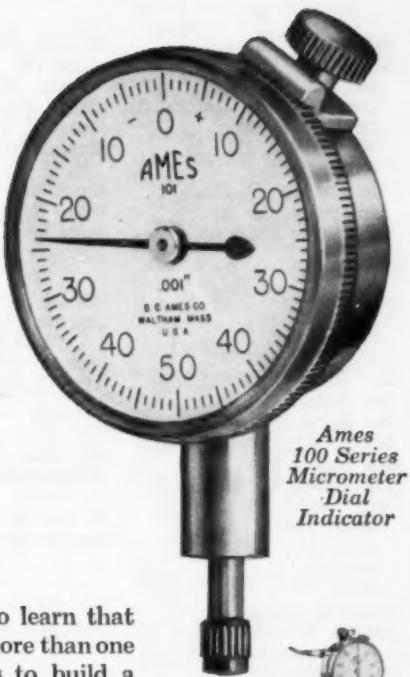
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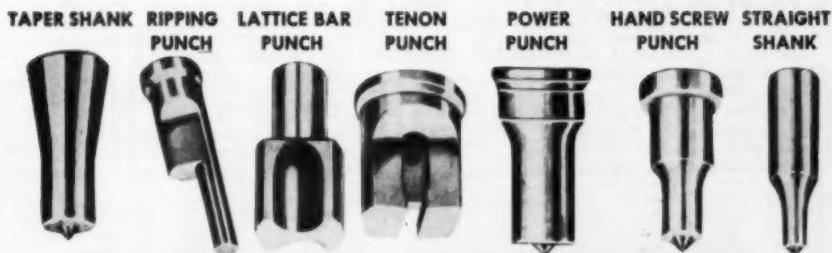
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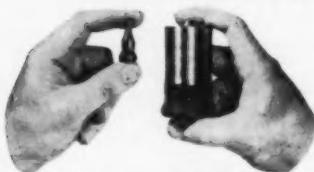
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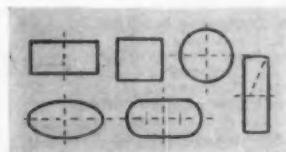


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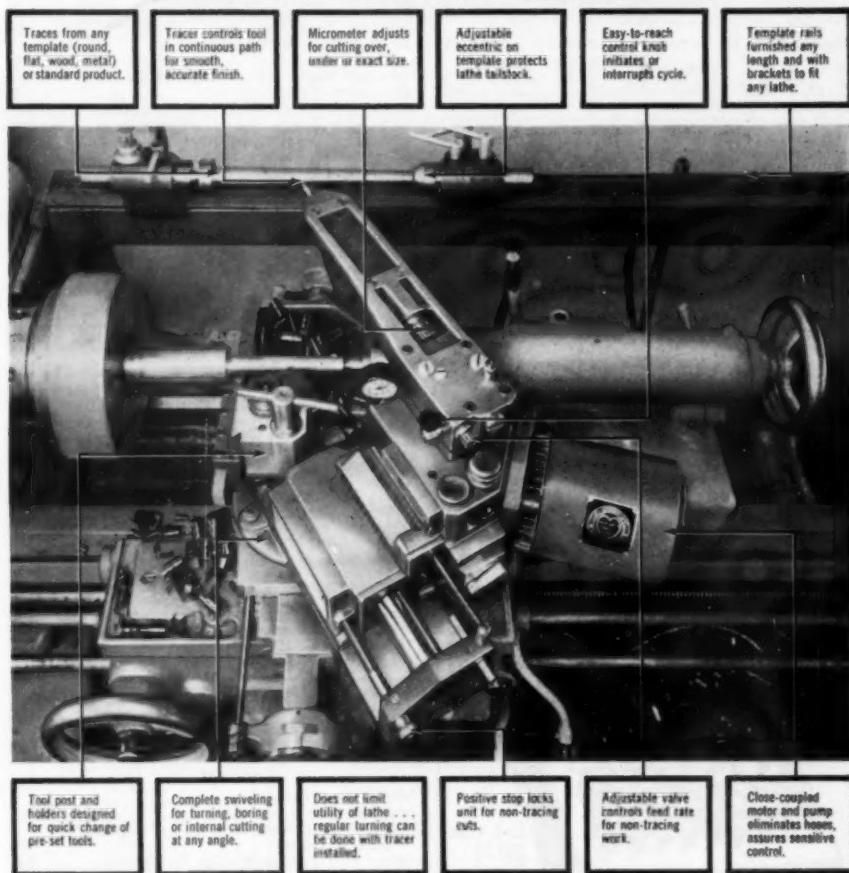
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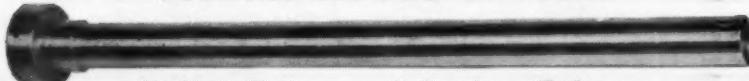
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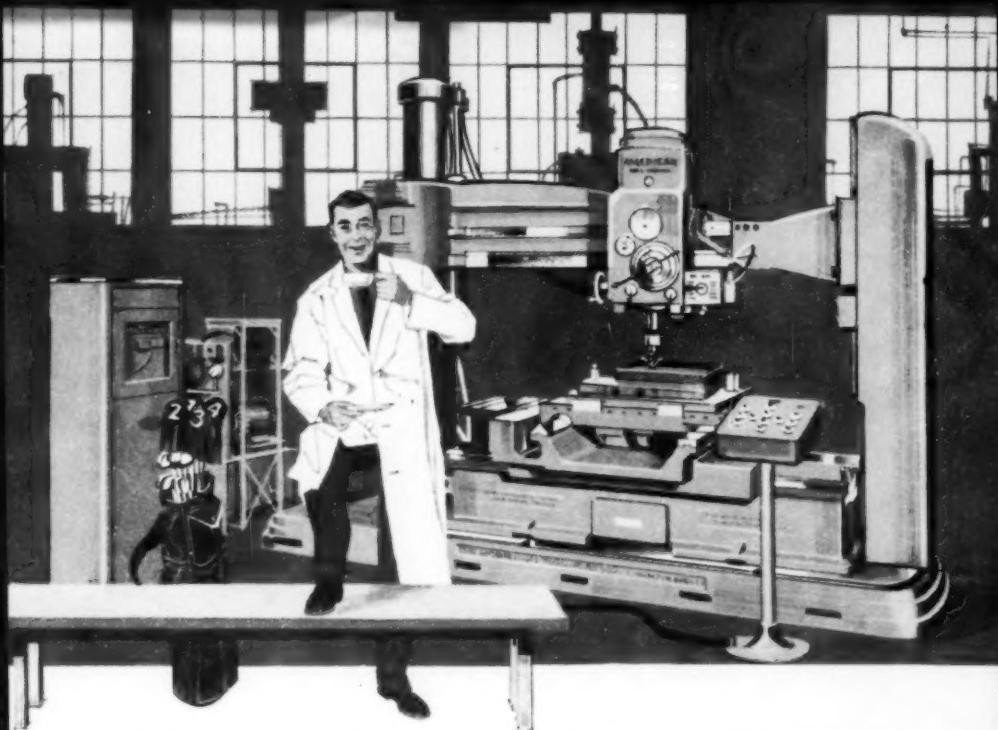
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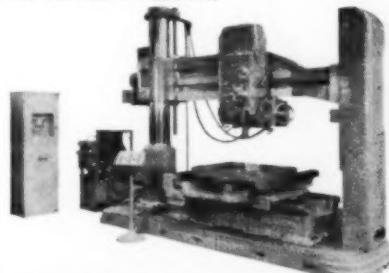
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